

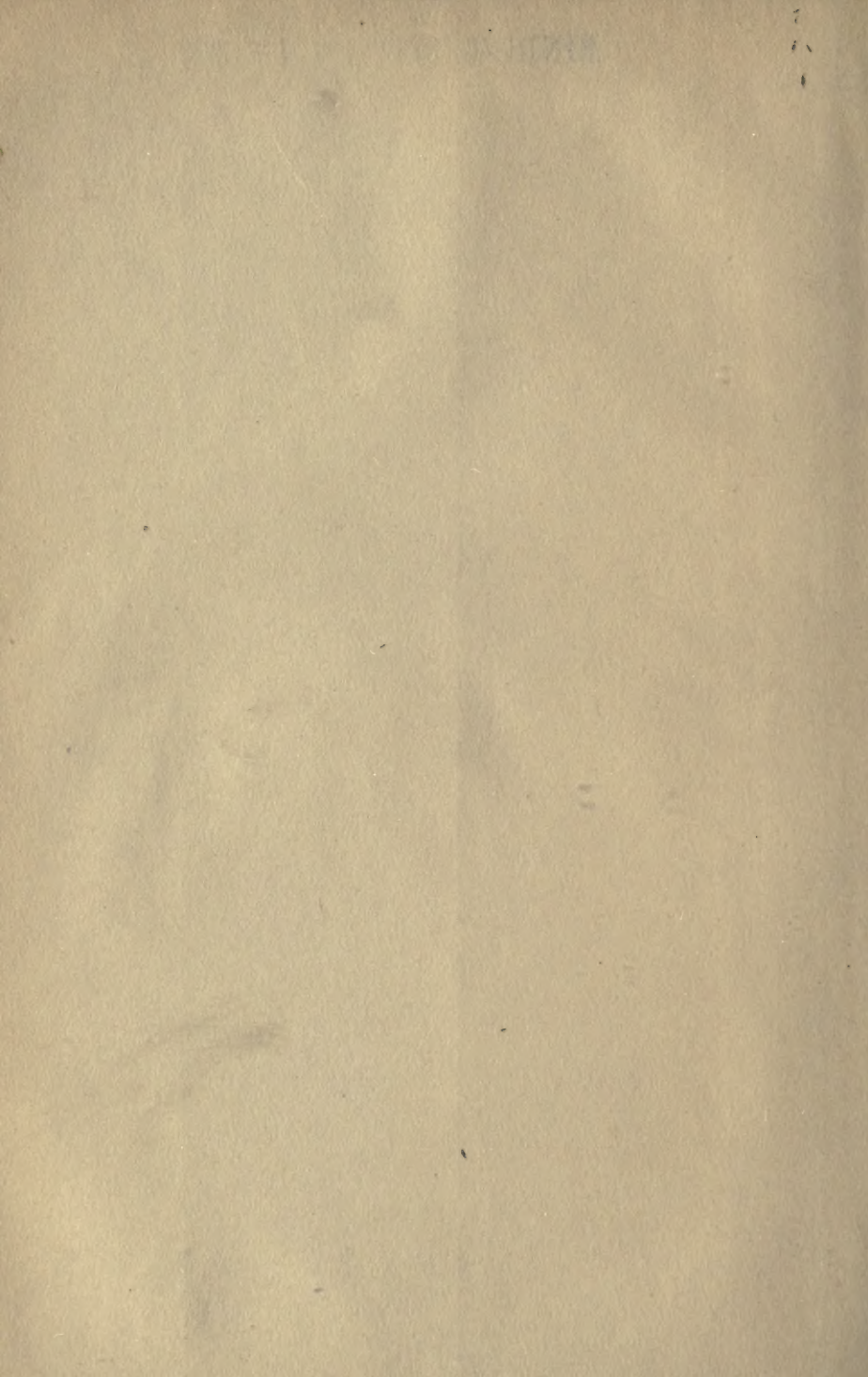
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The
Rockefeller Foundation

General Report

The Rockefeller Foundation
New York, New York



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The Rockefeller Foundation

Annual Report

1917

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The Rockefeller Foundation

61 Broadway, New York





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THE ROCKEFELLER FOUNDATION

Report of the President



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To the Members of The Rockefeller Foundation:
Gentlemen:—

I have the honor to transmit herewith a general review of the work of The Rockefeller Foundation for the period January 1, 1917, to December 31, 1917, together with the detailed reports of the Secretary and the Treasurer of the Foundation, the General Director of the International Health Board, the General Director of the China Medical Board, and the Director of the Rockefeller Institute for Medical Research as regards the special war activities of the Institute that have been supported by the Foundation.

Respectfully yours,

GEORGE E. VINCENT,
President.

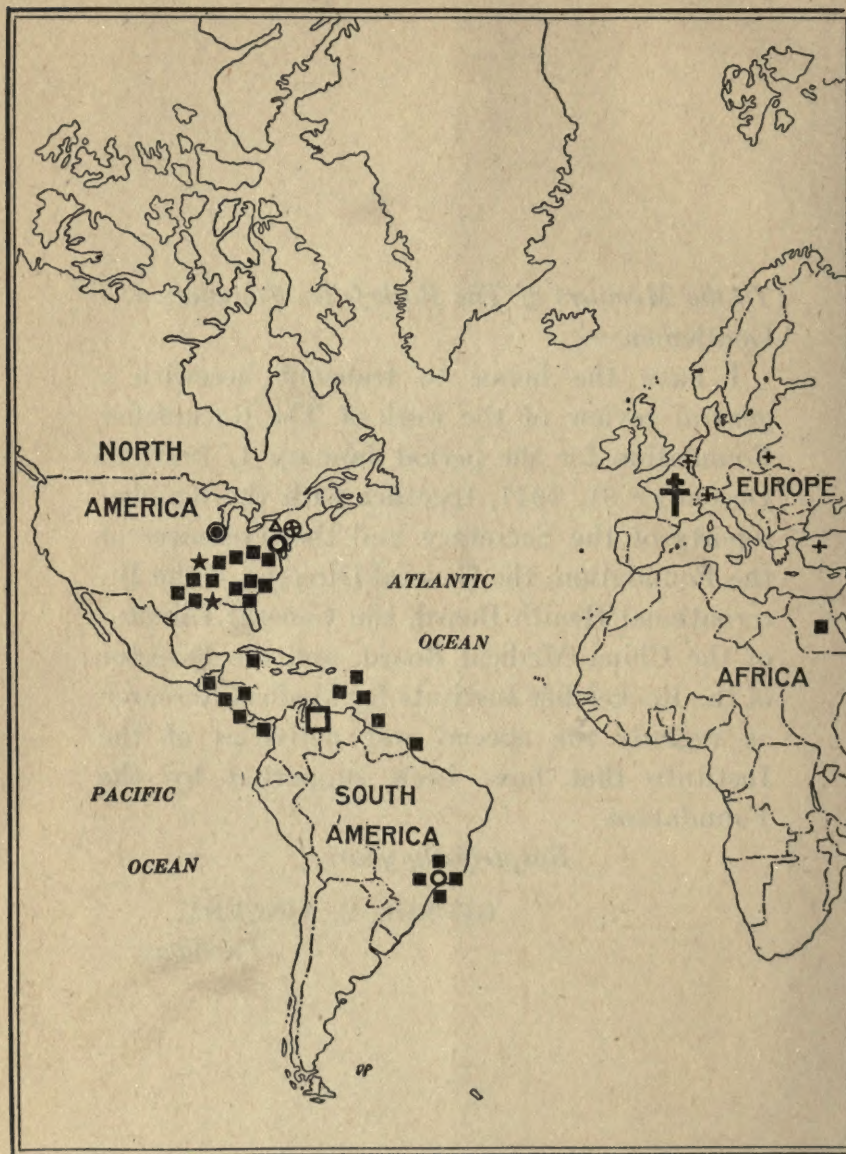


Fig. 1—Scope of Activities of The Rockefeller Foundation.



Work Through Other Agencies Not Indicated

THE ROCKEFELLER FOUNDATION

OFFICERS, MEMBERS AND COMMITTEES

1917

Chairman of the Board of Trustees

JOHN D. ROCKEFELLER, JR.

President

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Secretary

EDWIN R. EMBREE

Treasurer

LOUIS G. MYERS

Comptroller

ROBERT H. KIRK

Assistant Treasurer

LEFFERTS M. DASHIELL

Executive Committee

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Wallace Buttrick
Simon Flexner

Starr J. Murphy
Wickliffe Rose

Edwin R. Embree, *Secretary*

Finance Committee

John D. Rockefeller, Jr., *Chairman*

A. Barton Hepburn

Starr J. Murphy

Members

To Serve Until the Annual Meeting of 1920

Charles W. Eliot
A. Barton Hepburn

Charles E. Hughes
Wickliffe Rose

George E. Vincent

To Serve Until the Annual Meeting of 1919

Frederick T. Gates
John D. Rockefeller

John D. Rockefeller, Jr.
Julius Rosenwald

Martin A. Ryerson

To Serve Until the Annual Meeting of 1918

Wallace Buttrick
Simon Flexner
Harry Emerson Fosdick

Harry Pratt Judson
Starr J. Murphy
Frederick Strauss

THE ROCKEFELLER FOUNDATION

OFFICERS, MEMBERS AND COMMITTEES

1918

Chairman of the Board of Trustees

JOHN D. ROCKEFELLER, JR.

President

GEORGE E. VINCENT

Secretary

EDWIN R. EMBREE

Treasurer

LOUIS G. MYERS

Comptroller

ROBERT H. KIRK

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John D. Rockefeller, Jr.
Julius Rosenwald

Martin A. Ryerson

CONTENTS

THE ROCKEFELLER FOUNDATION

	PAGE
REPORT OF THE PRESIDENT.....	3
Financial Resources.....	19
Inroads Upon Principal.....	21
Supervision of Policy by the Trustees.....	23
Freedom of Action and Limitations.....	24
The Present Program.....	25
Working with the Red Cross and the Camp Commissions	26
Mental Diseases in War and in Peace.....	28
Caring for Victims of Infantile Paralysis.....	32
The Training of Sanitarians.....	33
Public Health Work in Many Lands.....	35
Helping Governments to Assume Responsibilities.....	37
A World-wide Research Staff.....	38
Beginning a Campaign Against Malaria.....	38
Cooperation with South American Institutions.....	39
Plans to Eradicate Yellow Fever.....	40
A Floating Dispensary and Hospital.....	41
Medical Education for China.....	43
Hospital Subsidies and Traveling Scholarships.....	45
Fostering Medical Research and Education.....	48
The Foundation as an International Force.....	49
REPORT OF THE SECRETARY.....	51
Membership.....	55
Executive Officers.....	55
Meetings.....	56
Executive Committee.....	57
Funds.....	57
Methods of Carrying Out Work.....	60
International Health Board.....	60
China Medical Board.....	60
War Relief Commission.....	61
Assistance to Other Agencies.....	62

INTERNATIONAL HEALTH BOARD

REPORT OF THE GENERAL DIRECTOR.....	67
PART ONE: CONTROL OF HOOKWORM DISEASE.....	79
The Year in Brief.....	77
Menace of Hookworm Disease.....	81
Character of the Disease.....	82
Effects of the Disease.....	83
Extent of the Disease.....	85
Infection Surveys.....	89
Survey of Papua.....	89
Survey of Tobago.....	93
Survey of Cayman Islands.....	94
Plans of Operation.....	98
Dispensary Plan.....	98
Intensive Plan.....	100
Scheme of Organization.....	103
Effectiveness of Curative Work.....	104
Effectiveness of Sanitary Work.....	107
How Intensive Work Is Carried Out.....	108
Development from Dispensary to Intensive Plan of Work.....	110
Treatment for Hookworm Disease.....	113
Drugs Used in Treatment.....	113
Smaller Dosage of Chenopodium Recommended....	114
Post-Campaign Measures and Fewer Treatments...	116
Treatment of Emigrants Over-Seas.....	120
Economic Results of Treatment.....	121
Treatment as a Means of Education.....	125
Treatment as a Means of Controlling Hookworm Disease.....	127
Treatment for Hookworm Disease as a Means of Reducing General Sickness Calls.....	129
Soil Sanitation as a Means of Control.....	132
Problem of Sewage Disposal.....	133
Soil Sanitation in Many Countries.....	135
Kiln Community of Mississippi.....	136
Virginia.....	139
British Guiana.....	140
Dutch Guiana.....	143
Nicaragua.....	144
Guatemala.....	145
Sanitation of the Soil in Advance of Treatment in Ceylon.....	145

Hookworm Disease in Mines.....	147
Infection in European Countries.....	147
Infection in the United States.....	149
Centers of Infection.....	150
Measures of Control.....	153
Results of Control Measures.....	153
Preliminary Work in China.....	154
Local Support of the Work.....	157
The Work in Brazil.....	157
Cooperation in Ceylon.....	165
Support in Southern States.....	168
Increase in State Health Funds.....	168
PART TWO: OTHER ACTIVITIES OF THE BOARD.....	171
Tuberculosis in France.....	173
Tuberculosis Dispensary Service.....	175
• Visiting Nursing.....	179
Campaign of Education.....	180
Malaria Control.....	184
Control by Sterilization of Carriers.....	184
Control by Screening.....	185
Control by Prophylactic Quinine.....	186
Control by Antimosquito Measures.....	189
Crossett, Arkansas.....	189
Hamburg, Arkansas.....	192
Eradication of Yellow Fever.....	198
Public Health Training in Brazil.....	200
Hospital Ship in the Sulu Archipelago.....	204
Tabular Summary.....	207

CHINA MEDICAL BOARD

REPORT OF THE GENERAL DIRECTOR.....	217
Work of the Year.....	223
The Peking Union Medical College.....	224
Faculty of Peking Union Medical College.....	227
Pre-Medical School at Peking.....	230
Faculty of the Pre-Medical School.....	231
The Shanghai Medical School.....	233
Aid to Existing Medical Schools in China.....	235
Support of Missionary Hospitals.....	237
Fellowships and Scholarships.....	239
Translation.....	243
Loss in Exchange.....	243
Miscellaneous.....	244

ROCKEFELLER INSTITUTE FOR MEDICAL RESEARCH

SPECIAL WAR ACTIVITIES

REPORT OF THE DIRECTOR OF LABORATORIES.....	247
War Work of the Rockefeller Institute for Medical Research.....	251
Carrel-Dakin Treatment of Wounds.....	255
Purpose of War Demonstration Hospital.....	256
Description of War Demonstration Hospital.....	258
Staff of War Demonstration Hospital.....	262
Instruction at War Demonstration Hospital.....	263
Research at War Demonstration Hospital.....	266
Available Laboratory Workers for Army and Navy .	267
Courses in Bacteriology.....	268
Therapeutic Serum.....	269
Erection of Stables.....	270
Production of Serum.....	271
Antigaseous Gangrene Serum.....	272
Antitetanic Serum.....	273
Antidysenteric Serum and Vaccination.....	274
Treatment of Pneumonia.....	274
Vaccination against Pneumonia.....	275
Epidemic Meningitis.....	275
Treatment of Syphilis.....	276
Combating Hemorrhage and Shock.....	277
Production of Acetone.....	278
Surgical Investigation at the Front.....	279

THE ROCKEFELLER FOUNDATION

REPORT OF THE TREASURER.....	281
Exhibit A—Balance Sheet.....	288-289
Exhibit B—Statements of Receipts and Disbursements of Income and of Other Funds Available for Appropriation.....	290
Exhibit C—1917 Foundation Appropriations, Unpaid Balances of Appropriations Made in Previous Years, and Payments Thereon Made in 1917.....	293
Exhibit D—Infantile Paralysis.....	299
Exhibit E—Mental Hygiene.....	300
Exhibit F—Rockefeller Institute for Medical Research..	300
Exhibit G—School of Hygiene and Public Health.....	301
Exhibit H—Founder's Designations.....	302
Exhibit I—Miscellaneous.....	303

CONTENTS

15

Exhibit J—International Health Board	306
Exhibit K—China Medical Board	311
Exhibit L—Summary of Appropriations and Payments..	326
Exhibit M—Additional Appropriations for Future Years.	327
Exhibit N—Statements of Principal Funds	328
Exhibit O—Lands, Buildings, and Equipment Funds....	329
Exhibit P—Transactions Relating to Invested Funds....	331
Exhibit Q—Schedule of Securities in General Funds on December 31, 1917, Representing Both Principal and Income Temporarily Invested	336
Exhibit R—Schedule of Securities in Special Funds on December 31, 1917.....	344

ILLUSTRATIONS

FIGURE	PAGE
1 Map Showing Activities of The Rockefeller Foundation . . .	6-7
2 Map Showing Activities of International Health Board . . .	70-71
3 World-wide Distribution of Hookworm Infection	86-87
4 Infection Survey Map of Barbados	90
5 Length of Service and Rate of Infection in Papua	92
6 Type of Native Houses in Tobago	95
7 Comparison of Two Boys of Same Age in Tobago	96
8 Treatment Group on Coffee Plantation at Guatemala . . .	101
9 Community Clinic in Ceylon	102
10 How Hookworm Activities are Carried Out in Costa Rica	109
11 Coolie Girl Before Treatment, Ceylon	117
12 Coolie Girl After Treatment, Ceylon	117
13 Coolie Woman Before Treatment, Ceylon	118
14 Coolie Woman After Treatment, Ceylon	118
15 Hemoglobin Increase, Treated Cases in Dutch Guiana . .	123
16 Hemoglobin Index Before and After Treatment	124
17 Reduction of Infection in Southern States	128
18 Reduction in Sickness Calls from All Diseases in Ceylon .	130
19 Survey of Kiln Community, Miss. Before Intensive Work	138
20 Survey of Kiln Community, Miss. After Intensive Work .	138
21 Typical West Indian Village in St. Lucia	141
22 Pit Latrine on Coffee Plantation in Guatemala	142
23 Group of Miners Infected with Hookworm Disease	151
24 Chinese Mine. Naked Bodies Exposed to Hookworms . .	152
25 Hookworm Infection at Pinghsiang Colliery, China	155
26 Nurse Making House-to-House Calls in Brazil	159
27 Taking Medicine Under Observation of Nurse in Brazil . .	160
28 Headquarters of Hookworm Work at Matale, Ceylon . . .	163
29 Awaiting Treatment at Assembly Ground in Ceylon	164
30 Expense Borne by Ceylon, Sao Paulo, and North Carolina	166
31 Appropriations to Boards of Health in Southern States . .	169
32 Crowd Welcoming Tuberculosis Commission in France . .	177
33 Mobile Tuberculosis Exhibit in France	178
34 Children Listening to Lecture on Tuberculosis in France . .	178
35 Poster Used by Tuberculosis Commission in France	181
36 Poster Used in Tuberculosis Campaign in France	182
37 Mosquito Breeding-Place at Crossett, Arkansas	187
38 Street Ditch at Crossett, Arkansas	187

39	Typical Mosquito Breeding-Place Before Ditching.....	188
40	Same Breeding-Place After Ditching.....	188
41	Calls for Malaria, 1915-1917, at Crossett, Arkansas.....	191
42	Antimalaria Operations at Hamburg, Arkansas.....	193
43	Breeding-Place for Mosquitoes at Hamburg, Arkansas....	195
44	Shallow Pond and Marshy Area at Hamburg, Arkansas....	195
45	Borrow Pit at Hamburg, Arkansas. Before Being Drained	196
46	Borrow Pit at Hamburg, Arkansas. After Being Drained	196
47	New Department of Hygiene at Sao Paulo, Brazil.....	201
48	Another View of Same Building.....	201
49	Hospital Ship "Busuanga" in the Philippine Islands.....	202
50	Interior View—Showing Ward of Hospital Ship.....	202
51	Perspective View of Peking Union Medical College.....	225
52	Laying Corner-stone of Peking Union Medical College....	226
53	Chart Showing Work Supported by China Medical Board.	241
54	War Demonstration Hospital at Rockefeller Institute....	253
55	Ward in Hospital Illustrating Carrel-Dakin Method.....	254

TABLES

1	Receipts, Disbursements, and Obligations in 1917.....	22
2	Contributions to Camp and Community Welfare.....	29
3	Summary of Expenditures for 1917.....	63
4	Summary of Hookworm Work in all Countries.....	208
5	Summary of Hookworm Work in Southern States.....	209
6	Summary of Hookworm Work in West Indies.....	210
7	Summary of Hookworm Work in Central America.....	211
8	Summary of Hookworm Work in the East.....	212
9	Expenditures of International Health Board, 1917.....	215

THE ROCKEFELLER FOUNDATION

FINANCIAL RESOURCES

The income of The Rockefeller Foundation would pay the current expenses of the United States Government for only seven hours; if the principal were used this would be exhausted in five days. The public functions of the city of New York could be supported for 12 days out of income, and for six months and 26 days out of endowment. At the present rate of expenditure the American Red Cross would consume the total income of the Foundation in 17 days, and the principal in less than ten months. It has been estimated that \$207,000,000 are disbursed annually for private charity in the United States. If The Rockefeller Foundation were called upon to assume this burden its income would carry the budget for twelve and one-half days; its invested funds for about seven months.

In the light of these facts it is obvious that the resources of the Foundation, measured by the needs of governments and large social undertakings, are relatively limited. Widely disbursed in aid of a large number of existing agencies, the income would have little appre-

cial effect; it might even chiefly replace rather than supplement gifts from other sources. Only by concentrating its funds upon a few convincing demonstrations and statesmanlike programs can the Foundation justify its existence, and constructively "promote the well-being of mankind throughout the world."

While it is true that the Foundation's income could not pay any appreciable share of society's bill for administration and charity, it is also a fact that for purposes of experiment, of demonstration, and of fostering comprehensive projects, the institution has substantial resources. On December 31, 1917, the principal fund of the Foundation had a book value of \$120,765,-865 and a market value of about \$105,000,000. The income of this fund for the year 1917 was \$7,153,852. To this were added a balance carried over from 1916, a gift by Mr. John D. Rockefeller of \$5,500,000, and the sum of \$5,000,-000 taken by vote of the Trustees from the principal fund.

The Founder's relinquishment in July of the right he had reserved in his deed of gift to control the annual expenditure of \$2,000,000 of income for purposes consistent with the charter, did not add to the total income of the Foundation. It did, however, including reserve from former years, increase by nearly \$2,000,000 the

sum at the complete disposal of the Board in 1917. In 1918, the entire income will be available for unrestricted use.

INROADS UPON PRINCIPAL

Table I on page 22, showing receipts, disbursements, and obligations in 1917, presents in summary form the Foundation's current resources and the different purposes to which these are being devoted. In order to understand this budget one must distinguish between "appropriations" and "disbursements." For example, in May, 1917, the Foundation appropriated \$5,000,000 to the American Red Cross, and agreed to pay this sum in ten monthly instalments of a half million dollars each. Seven such payments, a total of \$3,500,000, were included in the disbursements of 1917; the remaining \$1,500,000 will appear in the budget of 1918.

The cash balance carried forward into the year 1918, \$11,629,048, seems at first glance to be a large sum. It will be noted, however, that all but \$1,271,338 of this amount will be needed to meet appropriations and pledges for the next fiscal year. If the Foundation were to continue during 1918 to support war work at the present level of appropriation, almost the total

TABLE 1: Receipts, Disbursements, and Obligations in 1917

<i>Income Available</i>		<i>Disbursements</i>	
Balance—January 1, 1917.....	\$5,407,282	War Work.....	\$5,944,969
Income collected during the year.....	7,153,852	International Health Board.....	557,829
	<u>\$12,561,134</u>	China Medical Board.....	501,422
		Rockefeller Institute.....	3,127,914
		Founder's Designations.....	942,251
		Miscellaneous—	
		After care of infantile paralysis cases,	
		Mental Hygiene, School of Hygiene and	277,035
		Public Health, Miscellaneous.....	105,666
		Administration.....	<u>\$11,457,086</u>
<i>Extraordinary Funds Available</i>		<i>Obligations</i>	
Portion of Principal Fund made		Payments to be made on ap-	
available for appropriation....	\$5,000,000	propriations and pledges for	
Gift of Mr. John D. Rockefeller..	5,500,000	1917 and prior years.....	\$4,133,973
Portion of Estate of Laura S.		Payments on appropriations	
Rockefeller Fund made avail-		and pledges for 1918.....	6,223,737
able for appropriation.....	25,000		<u>\$10,357,710</u>
	<u>\$10,525,000</u>	Balance carried forward avail-	
		able for appropriation.....	1,271,338
			<u>11,629,048</u>
TOTAL.....	<u>\$23,086,134</u>	TOTAL.....	<u>\$23,086,134</u>

income from investments accruing in that year would be required for this purpose alone. This means that unless gifts for war activities are sharply reduced, the year 1919 will see a demand for further inroads upon the principal fund. Only the large gift by the Founder, his relinquishment of the right of designation, and the appropriation of \$5,000,000 of principal by the Trustees enabled the Foundation to disburse and pledge so extraordinary a total in 1917.

SUPERVISION OF POLICY BY THE TRUSTEES

During the year the stated meetings of the Board were so rearranged as to fall early in December, late in February, and at the end of May. At the meeting on December 5, 1917, the officers presented, in a docket which was sent to members a week in advance, a review of the appropriations made since the Foundation was chartered, budget estimates for the year 1918, a forecast of income and expenditures up to 1922, an outline of policies, and a general program for the immediate future. After full discussion, the Trustees approved a budget and sanctioned certain lines of procedure. At the same meeting officers were elected and salaries were fixed by the Board as a whole. Thus the Trustees participated in a careful review of the

Foundation's activities and in formulating plans for the coming year. Twice during the year the Trustees were invited to sit with the Executive Committee to consider large appropriations—one to the American Red Cross and one to the Young Men's Christian Association. These meetings were in effect special meetings of the entire Board. The Executive Committee by sending its minutes to the Trustees keeps them constantly informed of the steps by which their policies are being carried out.

FREEDOM OF ACTION AND LIMITATIONS

Government activities are, for the most part, necessarily and properly deliberate; they are limited by legal and administrative restrictions. A Foundation has, within the provisions of its charter, relatively a free hand. Only such an institution could, for instance, select the world's leading authority on a certain disease, provide a staff and all necessary funds, and send him to foreign countries in order to eradicate from the world one of the deadliest of infectious maladies. It would be a mistake, therefore, for The Rockefeller Foundation to hamper itself by adopting inflexible rules, or to tie its own hands with red tape.

Yet there are things which it cannot success-

fully or wisely do; such as, for example, give money or make loans to individuals, or invest in securities which have a philanthropic rather than a business basis, or assist in securing patents, or aid altruistic movements which involve private profit. It must also refrain from supporting propaganda which seek to influence public opinion about the social order and political proposals, however disinterested and important these may be. Thus, appeals to finance in whole or in part a speakers' bureau in behalf of the war, the teaching of patriotism in the public schools, and an advertising campaign for national prohibition have been denied on principle.

THE PRESENT PROGRAM

Demonstrations such as those which are being made at home and abroad in the field of public health, well-organized cooperative undertakings, like the camp and community plan for the welfare of American soldiers, a comprehensive program of inquiry of the sort which the National Committee for Mental Hygiene is carrying out, represent characteristic Foundation policies. The aim always kept in mind is not to assume governmental or social functions, but to show that certain things can be done success-

fully, and then as soon as may be to turn these over to the community.

The "well-being of mankind throughout the world" so obviously depends upon the winning of the war by the forces of freedom, that the Foundation is devoting by far the largest part of its available resources to the support of war work. At the same time, activities which are improving public health and thus contributing to human progress are being maintained in many parts of the world. The several projects which are described in the pages which follow are all parts of a program which aims at helping to win the war, and at making a better world after the war.

WORKING WITH THE RED CROSS AND THE CAMP COMMISSIONS

With the entrance of the United States into the war, The Rockefeller Foundation decided to withdraw its War Relief Commission from Europe and to put a large sum at the disposal of the American Red Cross, which, reorganized under a War Council, has undertaken comprehensive programs of relief, both to the allied armies and to the civilian populations of the war-stricken countries. Negotiations were also opened with this organization with a view to its

assuming responsibility for the care of the 500 Belgian children whom the Foundation had been maintaining in Switzerland since 1915. This policy of consolidation has been followed because, in the opinion of the Trustees, it is unwise to multiply independent and often overlapping agencies of war relief. The times call for unified, well-organized effort in this field. The only work which the Foundation is directly administering in Europe is an antituberculosis campaign directed by the Foundation's International Health Board, and intimately related to the American Red Cross's relief and health activities in France.

The Government has from the outset insisted that the training camps—especially those of the National (draft) Army—are not to be thought of as necessary evils to be mitigated, but as positive educational institutions of immense potential value. Whereas in the past the worst elements of communities have been mobilized to exploit and to debauch the soldier and sailor, today the best forces are combining to protect and benefit them.

The cooperation of official commissions and of national and local societies in providing—both within and without the camps—comfort, recreation, social entertainment, educational opportunity, moral safeguards, and idealistic influences

for the American forces, offers a striking example of genuine team-work. To nearly all of the units that make up this vast cooperation, The Rockefeller Foundation has given sums which aggregate approximately \$4,800,000, or about eight per cent. of the total budget for the entire undertaking. Table 2 on page 29 enumerates the different organizations, together with the war budget of each, and the amount appropriated to it by the Foundation.

MENTAL DISEASES IN WAR AND IN PEACE

The present war has shown strikingly that mental and nervous diseases play a prominent part in military medicine. The term "shell shock" has been hit upon to describe a wide range of cases from simple cowardice to true paralysis. To diagnose accurately and to treat successfully these nervous disorders has become a pressing need. During the months of May and June, 1917, Dr. Thomas W. Salmon, a recognized authority in this field, visited the British Isles, at the expense of The Rockefeller Foundation, and there made a study of the nature and treatment of nervous diseases in military hospitals. His report has been of value to the Surgeon General's office in formulating an army policy for the treatment and hospital

TABLE 2: *Contributions to Camp and Community Welfare—Budgets of the Several Organizations for the Period in General from July 1, 1917, to June 1, 1918, showing Amounts Contributed by the Foundation*

ORGANIZATION	Total Budget	Contributed by Rockefeller Foundation
Y. M. C. A.....	\$50,000,000	\$3,500,000
Y. W. C. A.....	5,000,000	650,000
Jewish Camp Welfare.....	1,000,000 ¹	100,000
Knights of Columbus.....	2,000,000 ²	100,000
Camp Community Fund (Recreation Association).....	4,000,000	220,000
Training Camps Commission.....	150,000 ³	75,000
Special Work with Commission of American Social Hygiene Association, etc.....	153,000 ⁴	125,000
TOTAL.....	\$62,303,000	\$4,770,000

¹ Part of a much larger general war fund raised by the Jewish Committee. The Foundation's gift was specifically to the camp work feature of that fund.

² This figure includes only subscriptions in 1917. The Knights of Columbus war work budget to the end of 1918 totals \$7,500,000.

³ This figure does not include \$750,000 appropriated by Congress.

⁴ This figure does not include services of men in many cases contributed to this work by societies with which they are connected

care of nervous cases, and also in devising a plan for examining volunteers and drafted men in order to exclude persons who are mentally or nervously unfit for military service.

In helping the Surgeon General to recruit the specialists needed for this work, in providing quickly supplies and expense funds which the Government either could not furnish at all or only after long delays, the National Committee for Mental Hygiene rendered during 1917 prompt and expert aid. Funds for these purposes are being furnished by The Rockefeller Foundation. Dr. Salmon, commissioned as a major in the Medical Officers Reserve Corps, has been sent to France to assume charge of that branch of the army medical service which has been entrusted with the care of "shell shock" and other nervous casualties.

During 1917 the Foundation has continued to support the program of the National Committee for Mental Hygiene in making surveys of methods of public care for the insane and the feeble-minded, and in carrying out demonstration studies of abnormalities in a given community and of the mental characteristics of criminals. The care of the insane and the feeble-minded varies widely in the different States of the Union. It lags, on the average, far behind the progress made in the treatment

of other forms of disease. The public attitude toward mental maladies is still affected by superstition and ignorance. The persons in charge of State and county institutions and the attendants are too often conventionally minded, frequently untrained, occasionally indifferent, and at times even brutal. While many are good, too often State hospitals are either wholly lacking or are quite unequal to their responsibilities.

Since 1915, surveys of conditions have been made and recommendations formulated in 12 States. In a number of instances the results were prompt and striking. For example, in one State, a month after the report of a survey made at the Governor's request appeared, the legislature appropriated a half-million dollars for rehabilitating and modernizing in management the State Hospital for the Insane. In another State, during 1917, on the basis of a plan formulated by Dr. Salmon, \$600,000 was granted for a similar purpose.

The first report of the Psychiatric Clinic at Sing Sing Prison has appeared recently. This includes studies, supervised by the National Committee for Mental Hygiene, of the personal histories and mental and moral characteristics of 600 persons successively admitted to the institution during a period in 1916-1917. These

records indicate that a large percentage of criminals are mentally abnormal and point to the conclusion that the system for dealing with convicted persons ought to be modified. The results of this study have had an influence upon the formulation of new plans for institutional organization in New York State.

In connection with a children's court in a large city, studies have been made of mental traits, moral qualities, and environmental influences. It is believed that the results of these investigations will throw light upon the problem of juvenile delinquency and suggest better methods of dealing with it.

CARING FOR VICTIMS OF INFANTILE PARALYSIS

To the after care of the New York children who in the epidemic of 1916 were victims of infantile paralysis, the Foundation has made contributions through a special committee for New York City and through the State Charities Aid Association. A large number of children have been supplied with braces, the use of which in most cases is only temporarily necessary. By systematic massage and special exercises gratifying results have been secured; hundreds have been wholly restored or are on the way to com-

plete recovery, while in the case of many others, disabilities are being minimized. Plans have been made to continue the clinics and home treatments which have proved so successful.

Not only have hundreds of children been cured or greatly improved by this after care, but important knowledge has been acquired which will prove of great value in dealing with the problems of infantile paralysis in the future. An important by-product of the after care work in New York City has been the cooperation of various outpatient agencies which, under the guidance of a central committee with funds at its disposal, have developed common standards and methods of treatment. It would be an excellent thing for the city if this plan were extended to include the standardizing of all the services in which the dispensaries of Greater New York are engaged.

THE TRAINING OF SANITARIANS

Impressed by the need of fostering research in the field of preventive medicine and of providing thorough training for public health officers, laboratory personnel, field workers, nurses, and inspectors, The Rockefeller Foundation, in 1915, offered to bear the cost of establishing and maintaining, as a part of Johns Hopkins

University, a School of Hygiene and Public Health. During the academic year 1917-18 a notable faculty is being recruited, policies are being determined, and plans for a special laboratory and administration building are being prepared. Dr. William H. Welch resigned his professorship in the Johns Hopkins Medical School to become director of the new school.

While this institution will necessarily maintain close relations with the Medical School, it will not be subordinate to that division of the University. The School of Hygiene and Public Health will have its own quarters, its own faculty, its own problems and purposes, its own distinct body of students, and will develop from the outset a corporate individuality and a professional spirit.

The preliminary bulletin of the new school announces the conditions of admission and the courses of instruction which will go into effect with the opening of the institution in October, 1918. The terms of admission are most liberal; at the same time the requirements for degrees set a high standard. Not only will regular full-time students be provided for, but arrangements will be made by which health officers in active service may resort to the school for short, intensive courses. The departments so far organized are: Bacteriology and Immunology,

Dr. William H. Welch; Physiology, Dr. William H. Howell; Chemistry, Dr. E. V. McCollum; Biometry and Vital Statistics, Dr. Raymond Pearl. Instruction in Sanitary Engineering will be organized by Professor Charles J. Tilden, and lectures on Sanitary and Administrative Law will be given by President Frank J. Goodnow.

For quarters during the first year, a recently vacated University building is being renovated and equipped. It is hoped that the new laboratory will be ready for occupancy soon after the end of the war. While the School properly begins its work conservatively and unpretentiously, there is reason to expect that it will gradually win recognition as a national—even an international—center of research and teaching, and thus come to play a leading part in the fields of preventive medicine and public health administration which are today being so rapidly extended.

PUBLIC HEALTH WORK IN MANY LANDS

It was chiefly the experience of the International Health Board of The Rockefeller Foundation, in health work at home and abroad, that called attention to the need of a school such as has been established in Baltimore. This Board has developed definite aims, constructive policies, and consistent programs. The Tuber-

culosis Commission in France was properly put in charge of this agency of the Foundation. The appended report of the General Director, Wickliffe Rose, shows that during 1917 steady progress has been made by the International Health Board in conducting its warfare against hookworm disease, malaria, and yellow fever; in promoting public health administration; in securing the passage of better sanitary laws; in persuading governments to increase their expenditures for preventive medicine; in encouraging public health education; in gathering information concerning medical education in South America, and in increasing knowledge about the effective treatment of certain infectious diseases.

Work for the control of hookworm disease was extended during the year 1917 to three of the States in Brazil, to Siam, the Fiji Islands, Seychelles Islands, and to four additional States of the Union—Alabama, Arkansas, Georgia, and Maryland. In one country, Antigua, the work which had been undertaken in 1915 was completed. The Board was at work during the year in 37 areas, which included 12 American States and 25 foreign states and countries. Late in the year 1917, the International Health Board began in the Pinghsiang Colliery in Kiangsi Province, China, its first attempt to deal with hookworm control in mines. The moisture and high tem-

peratures in underground workings offer favorable conditions for the development of the eggs.

HELPING GOVERNMENTS TO ASSUME RESPONSIBILITIES

Only a study of the report of the General Director of the International Health Board can make one fully realize the detail and the value of the work which is being carried on by its staff of 556 persons scattered over the world. It is gratifying to note, therefore, that governments everywhere are showing willingness to assume an increasing share of the expense involved. Such response is a real test, for unless governments are prepared to assume responsibility for controlling hookworm and other infectious diseases, the service of a private foundation can at best be palliative, ephemeral, and in the end futile.

Governments, stimulated by the facts brought to light by the International Health Board, are enacting sanitary laws. For example, 20,000 latrines—essential to preserve the soil from the pollution which spreads hookworm infection—have been recently erected under legal compulsion in the villages of Kalutara Province in Ceylon. Greatly improved sanitary laws and administrative codes have been adopted in the West Indies, in Seychelles Islands, and in Guate-

mala. In certain countries individual planters and large estates are cooperating with the Board by bearing all or a large part of the expense.

A WORLD-WIDE RESEARCH STAFF

The staff of the International Health Board constitutes a unique agency for cooperative research. Scores of specialists assigned to stations in many parts of the world are under the direction of a single administration, and may be quickly instructed to test under a wide variety of conditions a new discovery or a promising theory. For example, the Board's Commission to the Orient, which returned in August, 1917, from a visit to the Malay States, Java, and Fiji, reported that methods of hookworm control could be improved. If, after additional experiments, these new methods continue to prove promising, they will be submitted to the whole staff for testing and further report. The Commission to the Orient also made studies of the mental, physical, economic, and social effects of hookworm disease upon an infected population.

BEGINNING A CAMPAIGN AGAINST MALARIA

In the fight against hookworm disease, the staff of the International Health Board has come frequently in contact with malaria. This malady is

prevalent not only in the Orient but also in certain American areas, particularly in the Southern States. The depressing effects of the disease on bodily and mental vigor, on personal happiness and community spirit, are well known. The detailed reports of demonstrations which have been conducted in communities in Arkansas and Mississippi disclose a quick response to the methods employed, reveal the fact of low per capita costs, and show in how short a time towns and villages can be convinced that it pays to appropriate funds for public health purposes.

COOPERATION WITH SOUTH AMERICAN INSTITUTIONS

The real aim of the International Health Board is not merely to specialize in two or three infectious diseases, but by concrete demonstrations in the control of these maladies, to fix attention upon problems of public health and to induce governments to give more attention to this fundamental need. The Board inevitably becomes interested in the training of public health officials and in medical education in foreign countries. It has recently, for instance, shown such an interest in South American progress. Dr. R. M. Pearce, in behalf of the Board, made an investigation into medical education and

public health activities in Brazil, Argentina, and Uruguay. As a result, the International Health Board has agreed to assist the University of Sao Paulo (Brazil) in establishing a Department of Hygiene. This will be directed for five years by an American professor. At the end of this period he will be succeeded by a Brazilian, who will meantime have been trained in the United States. Two fellowships have also been provided for bringing promising Sao Paulo physicians to this country for training in public health.

In similar fashion a department of pathology is being created in the Bello Horizonte Medical School. A fellowship has been granted for the training in the United States of a Brazilian pathologist who will in due time assume charge of this new department. These initial attempts to establish relations with foreign medical centers, and to encourage student migration and exchange professorships, are full of significance for the future.

PLANS TO ERADICATE YELLOW FEVER

But for the war, Surgeon General Gorgas and his colleagues would have sailed in the early summer of 1917 for South America to begin a campaign for ridding the world of yellow fever. In 1916 he had headed a commission of the Inter-

national Health Board to South America and had delimited the seed-beds of the disease. The sources of the infection are believed to be at Guayaquil on the west coast of South America, in a region along the south shores of the Caribbean Sea, in a strip along the north Brazilian coast, and in a certain area on the west coast of Africa. General Gorgas, as the leading authority on yellow fever, was appointed chief of an expedition to eliminate infection from these regions. He was requested to nominate men for his staff and sufficient funds were granted for carrying out the undertaking.

Although General Gorgas has had to devote himself to his war duties and the main effort has therefore had to be postponed, representatives of the Board, as scouting parties, have been on guard in certain regions. The real fight against yellow fever will come when the war is over. It is hoped wholly to exterminate yellow fever from the world.

A FLOATING DISPENSARY AND HOSPITAL

Dispensaries and physicians have of late been peacefully penetrating areas of the Philippine Islands and demonstrating the fact that, for purposes of placating primitive and suspicious peoples, medicine has some advantages over

machine guns. The Sulu Archipelago contains 300 or more islands almost out of touch with the rest of the world. These, with many remote villages along the shores of Mindanao, include areas which heretofore have not been accessible to medical men. In 1915, Bishop Charles H. Brent and Dr. Victor G. Heiser, proposed that a dispensary and hospital ship be equipped and manned for service to the populations of the Department of Mindanao and Sulu, generally referred to as non-Christians. The International Health Board offered to meet the cost of remodeling and fitting out a Government vessel, and agreed to contribute towards its maintenance for five years, on condition that at the end of that time the entire expenses should be assumed by the Philippine authorities.

On November 12, 1917, the ship "Busuanga" was put in service. The ship is fitted with a modern operating room, a ten-bed hospital ward, a pharmacy, and suitable quarters for the crew and for the staff, which includes an American doctor, a Filipino assistant, a bacteriologist, an American chief nurse, and two native nurses. This floating dispensary will touch regularly at points on the coasts of Mindanao and the islands of the Sulu Archipelago. Outpatient service will be rendered and emergency operations performed at each port of call. Cases

which require hospital care will be transported in the ship's ward to one of the base hospitals which have been established at Jolo and Zamboanga.

This experiment will be watched with interest, for it will have a bearing upon the international problem of dealing with backward people. It has, moreover, general significance for the development of a system of mobile dispensaries operating from a base hospital. The principle may find expression equally well in a motor-car dispensary, with doctor and nurse, operating through a rural area from a general hospital in an American county.

MEDICAL EDUCATION FOR CHINA

Looked at world-wise, it is not far from the Philippines to China, where, through its China Medical Board (under General Director Wallace Buttrick), The Rockefeller Foundation is working out a demonstration of modern medical education and hospital administration. On September 24, 1917, the Minister of Education of the Chinese Republic laid the corner-stone of a new institution, the Peking Union Medical College, which the Board is building in the Chinese capital. This group of laboratories, hospital wards, service buildings, and staff residences will embody all the approved features

of a modern medical center. The external forms will, however, be in harmony with the best traditions of Chinese architecture, and will thus symbolize a desire to make the college not something imposed from without, but an agency which shall in time become an intimate, organic part of a developing Chinese civilization.

In order to prepare students to enter the new medical college it has been deemed best to establish in Peking a pre-medical school which among other things will ensure proper grounding in physics, chemistry and biology, and in the English language, in which instruction in the college is to be conducted. Such a school was opened in Peking in September, 1917, with a faculty of five instructors and a student enrolment of eight. Six members of the college faculty have been appointed; and unless the war creates still further difficulties it is expected that, with a complete staff and fully equipped new buildings, the college will open its doors to students in September, 1919.

The program for China calls also for a medical school and hospital at Shanghai. The war has made necessary the postponement of this building project. The difficulty of securing a staff, the high cost of building materials, the unfavorable condition of foreign exchange, all forbid a present beginning. During the year

1917, the Shanghai Medical School has been incorporated, trustees have been appointed, a provisional charter has been secured from the Regents of the University of New York, and an acting dean, Dr. H. S. Houghton, has been chosen. Plans for buildings are being prepared.

Instead of establishing a separate pre-medical school in Shanghai, the Board has decided to help certain existing institutions to strengthen their curricula and to increase their staffs. Funds have been appropriated to three missionary colleges of unquestioned rank toward the cost of laboratories and equipment, and for additional instructors. In order to establish standards for the guidance of the Board in making future grants, the Trustees have expressed a willingness to finance an educational survey to be made by experts under the auspices of a joint committee, on which the leading missionary societies will be represented. A survey of this kind should result in the classification of institutions, the setting of minimum standards, and the working out of a comprehensive educational program.

HOSPITAL SUBSIDIES AND TRAVELING SCHOLARSHIPS

The medical schools in Peking and Shanghai cannot be successful in isolation. They must work in close relations with the preparatory

schools, the hospitals, the medical missionaries, and the modernly trained native physicians who form the nucleus of the new medical profession gradually being created to meet the needs of an awakened China. This cooperation has already taken the form of grants to schools which have been mentioned, and of subsidies to missionary hospitals. During 1917 nearly \$50,000 was given to hospitals in a dozen centers of Northern and Central China.

For a number of years the China Medical Board's hospitals will provide a sufficient number of internships for the graduates of the Peking and Shanghai schools, but in time it will become necessary to place students as interns in outside hospitals. The strengthening and standardizing of a number of such hospitals is so important that the Board has been willing to have a share in stimulating progress in this direction. A study of the situation serves only to make one realize more vividly how much has been accomplished by devoted and self-sacrificing medical missionaries in China.

The new schools and hospitals in Peking and Shanghai will enable the medical missionaries to keep abreast of current discoveries and procedures in medicine, surgery, and public health. Frequent short courses at one of these schools will prove in some respects more valuable than

study at long intervals in the medical institutions of the United States and Europe. Pending, at any rate, the completion of the new schools, the China Medical Board is granting fellowships and scholarships to medical missionaries for study in this country. Aid is also being given to native physicians, nurses, and students to pursue courses in American institutions.

A substantial beginning in the encouragement of student migration on a world-wide basis has been made. During the year 1917, Foundation funds to the amount of \$45,487.24 enabled 57 individuals to come to the United States for training. The group included: one Brazilian doctor, three Chinese pharmacists, three Chinese nurses, seven Chinese students, 12 Chinese physicians, and 31 medical missionaries from China.

The possibilities of extending this plan under the auspices of international committees are being considered. Overtures have come recently from French and Japanese sources. While there will be no concerted scientific boycott after the war, international intercourse in research and teaching will inevitably seek many new channels. The United States will undoubtedly play an increasingly important part in the scientific collaboration of the world.

FOSTERING MEDICAL RESEARCH AND EDUCATION

The growth of the Rockefeller Institute for Medical Research has called for increasing sums both for equipment and for current expenses. The higher cost of services and supplies has of late demanded still larger maintenance funds. For the last two years the Foundation has voted grants for building projects and for the maintenance of the Institute. During 1917 the sum of \$2,000,000 was appropriated as an addition to its endowment. By these gifts substantial contribution has been made by the Foundation to the work of medical research, the results of which have been of signal importance. Mention has already been made of the war service which the Institute is rendering at this critical period.

Furthermore, research and medical education have been fostered by the Foundation not only through the Institute and in China and South America, but in cooperation with the General Education Board in the United States as well. Toward the comprehensive program for creating a modern medical center at the University of Chicago, the Foundation has pledged itself to give \$1,000,000.

THE FOUNDATION AS AN INTERNATIONAL FORCE

The many normal activities of The Rockefeller Foundation are not isolated items, each independent of the others. They all fall into a world-wide organization in the interests of scientific knowledge applied to human welfare. Research, medical education, public health administration, surveys and commissions, exchange of specialists, student migration, are different aspects of a large plan and purpose. A glance at the map (Fig. 1, pages 6 and 7) on which the points of Foundation activities are indicated, gives one an impression of world-wide service to mankind.

When at last peace comes, it cannot quickly bring universal confidence and good-will. There may be years of suspicion and bitterness, of misunderstanding and recrimination; there is sure to be keen industrial and commercial competition. Is it too much to hope that such work as the Foundation is doing in many parts of the world may tend at least to emphasize the common interests of mankind in turning science from the destruction of the race to the healing of the nations?

THE ROCKEFELLER FOUNDATION

Report of the Secretary

To the President of The Rockefeller Foundation:

Sir:

I have the honor to submit herewith my report on the activities of The Rockefeller Foundation for the period January 1, 1917, to December 31, 1917.

Respectfully yours,

EDWIN R. EMBREE,

Secretary.

THE ROCKEFELLER FOUNDATION

The review by The President outlines the policies by which The Rockefeller Foundation is being guided in its work, sketches its present program, and describes the results aimed at and accomplished during the year 1917. The following report depicts the organization and the agencies through which these results were reached, and outlines the methods by which the programs of the several departments were carried out.

MEMBERSHIP

At the annual meeting in January, 1917, Wallace Buttrick, Charles E. Hughes, Julius Rosenwald, and George E. Vincent were added to the Board. At the May meeting of the Board Dr. Eliot's resignation was presented and accepted with regret.

EXECUTIVE OFFICERS

Amendments to the Constitution adopted at the annual meeting in January created the new position of Chairman of the Board of Trustees. To this position Mr. John D. Rockefeller, Jr.,

formerly President of the Foundation, was elected. Dr. George E. Vincent, then President of the University of Minnesota, was elected President, succeeding Mr. Rockefeller. Mr. Edwin R. Embree, of Yale University, was elected Secretary, succeeding Mr. Jerome D. Greene, who had served as Secretary since the organization of the Foundation and whose resignation, presented during the previous year, was accepted with an expression of appreciation of his services during the important formative period of the Foundation's history. Mr. L. G. Myers and Mr. Robert H. Kirk were reelected respectively to the positions of Treasurer and of Comptroller.

MEETINGS

Regular meetings of the Foundation were held in January, May, and October of 1917, the October meeting being adjourned to December to reconvene in accordance with a revised schedule of meetings embodied in newly adopted amendments of the Constitution and By-Laws. At the December meeting, the officers presented for consideration and action the program of work for the coming year together with a preliminary budget.

EXECUTIVE COMMITTEE

The details of the work, within the general policies approved by the trustees, were determined from time to time by the Executive Committee. This Committee meets regularly the first Tuesday in each month and at other times on call. Twenty-nine meetings were held during the year 1917.

FUNDS

The funds with which the Foundation carries on its work have undergone three important alterations during the year.

1. The general fund, amounting at the beginning of the year to \$100,000,000, was added to by a gift from Mr. John D. Rockefeller, received on February 23, of securities of market value of \$25,765,506.

A second gift during the year from Mr. Rockefeller, received December 29, of \$5,500,000, was added to income. The following letter from Mr. Rockefeller accompanied the gift:

December 29, 1917.

Gentlemen:

In view of the increasing demands upon the funds of the Foundation arising in connection with the war, and having in mind particularly the large contributions made

to the American Red Cross War Fund and the War Work of the Young Men's Christian Association, I enclose herewith my check for \$5,500,000 to be used as the Foundation may see fit for furthering its corporate purposes.

Very truly yours,

(Signed) JOHN D. ROCKEFELLER.

2. In order to meet the increasing demands upon the Foundation arising in connection with the war, the Trustees voted to use during the year, in addition to income, a part of the principal fund. Five million dollars from the principal was appropriated during the year and the Trustees gave authority to use a second \$5,000,000, if necessary. It is hoped that the gift of \$5,500,000 to income from Mr. Rockefeller, received at the close of the year, will make it unnecessary to use the second \$5,000,000 of principal.

3. The Founder released the Foundation from the condition contained in his letter of gift of March 6, 1914, which had obligated the Foundation to hold the sum of \$2,000,000 annually for objects within the corporate purposes of the Foundation which were to be specified by him. In releasing the Foundation from this obligation, the Founder surrendered all right to designate the application of any portion of the income of the Foundation. On this occasion Mr. Rockefeller wrote the following letter:

July 19, 1917.

Gentlemen:

My letter of gift of March 6, 1914, contained the following provisions:

"It is a condition of this gift that from the income of the Foundation the sum of Two million dollars (\$2,000,000), annually, or so much thereof as I shall designate, shall be applied during my lifetime to such specific objects within the corporate purposes of the Foundation as I may from time to time direct. If at the close of any fiscal year there shall remain any balance of the \$2,000,000 which I have not thus designated during the fiscal year, such balance shall be transferred to the general unrestricted income of the Foundation, to be used as the Foundation shall see fit. Subject to the foregoing provision, the principal as well as the income of this gift may be used in your discretion for any of the corporate purposes of the Foundation."

In view of the increasing demands upon funds of the Foundation, especially those arising in connection with the great war for human freedom in which our country is now engaged, which have led the Foundation to appropriate a part of its principal, as well as all of its income, I hereby release the conditions set forth in the provisions quoted above, and surrender from this date all right to designate the application of any portion of the income of the Foundation, and release the Foundation from any designations heretofore made which have not already been paid.

Very truly yours,

(Signed) JOHN D. ROCKEFELLER.

METHODS OF CARRYING OUT WORK

The agencies through which the Foundation accomplishes its work are of two classes:

1. Those agencies which it creates to carry out specific programs.

2. Other existing organizations, unaffiliated with the Foundation, to which it makes appropriations in order to enable them to carry out specific programs.

Agencies of the first class, that is, subsidiary or departmental organizations, have been maintained during the year as follows: (1) The International Health Board, (2) The China Medical Board, and (3) The War Relief Commission.

INTERNATIONAL HEALTH BOARD

The International Health Board has carried on the main branches of the work of the Foundation in public health in accordance with plans approved by the Board and with funds appropriated by the Foundation.

CHINA MEDICAL BOARD

The China Medical Board is charged with the Foundation's work in the development of medical education in China.

At the May meeting Mr. Frederick T. Gates resigned from the position of Vice-chairman of the Board, which he had held since its creation in 1915, and from membership on the Board. Changes in the rules of the Board adopted during the year made the President and Secretary of The Rockefeller Foundation, ex-officio, Chairman and Secretary respectively of the China Medical Board. These officers succeeded in these positions John D. Rockefeller, Jr., former Chairman, and Eben C. Sage, former Secretary. In Dr. Buttrick's absence from America for several months during the year, Dr. Houghton, Acting Dean of the Shanghai Medical School, acted for the Director of the Board.

WAR RELIEF COMMISSION

The War Relief Commission, which had been maintained in Europe since the early months of the war, was withdrawn in March, 1917. The Foundation, feeling that American effort in European relief should be unified, demonstrated its continued interest in this field of service by a contribution of \$5,000,000 to the American Red Cross.

ASSISTANCE TO OTHER AGENCIES

In addition to the work carried out through the departmental organizations described above, The Rockefeller Foundation has contributed during the year to the accomplishment of work undertaken by other and unaffiliated organizations.

The work of the year, whether through its own agencies or by assistance to unaffiliated organizations, has been chiefly within the three fields of war work, public health, and medical education.

On pages 63, 64 and 65 (Table 3) will be found a summary of payments made by The Rockefeller Foundation for all purposes during the year 1917. This tabular summary outlines, in terms of expenditures, the work described in terms of aims and results in the President's report. In many instances these payments involve sums expended on account of appropriations made in former years. On the other hand, they represent but partial payments on many of the appropriations made during 1917, which will provide for continuing work during succeeding years. For a full statement of the finances of the Foundation, see the Report of the Treasurer, pages 281 to 344.

TABLE 3: *Summary of Expenditures for 1917*

I. WAR WORK

*Camp and Community Welfare*¹

Commission on Training Camp Activities, Auxiliary Fund.....	\$25,000.00
American Social Hygiene Association and New York Committee of Fourteen for work under direction of Commission	27,376.71
Camp Community Fund (Recreation Association of America).....	145,000.00
Y. M. C. A.....	1,270,000.00
Y. W. C. A.....	46,974.13
Jewish Welfare Committee.....	100,000.00
	<hr/>
	\$1,614,350.84

Medical Research and Relief

War Demonstration Hospital at Rockefeller Institute.....	\$200,000.00
Medical Research of Rockefeller Institute	1,836.32
Yale Mobile Hospital Unit.....	25,000.00
National Committee for Mental Hygiene	1,798.40
	<hr/>
	\$228,634.72

Humanitarian Aid

American Red Cross.....	\$3,544,372.00
Belgian Relief Commission.....	100,000.00
Oxford Committee for Assisting Belgian Professors.....	7,482.43
American Committee for Armenian and Syrian Relief.....	50,000.00
Y. M. C. A., for Prisoners of War and Foreign Armies.....	225,000.00
War Relief Commission Expenditures in Various European Countries.....	175,128.54
	<hr/>
	\$4,101,982.97
	<hr/>
Total War Work.....	\$5,944,968.53

¹ An appropriation of \$100,000 to the camp work of the Knights of Columbus will be paid in 1918.

II. PUBLIC HEALTH

International Health Board

Hookworm, Malaria, and Yellow Fever Work Throughout the World.....	\$431,992.24
Tuberculosis in France.....	38,481.37
Public Health Education in Brazil.....	8,621.17
Miscellaneous.....	78,734.40
After Care of Infantile Paralysis Cases in New York City and State.....	44,737.49
Studies and Demonstrations in Mental Hygiene...	48,800.00
School of Hygiene and Public Health of Johns Hop- kins University.....	31,319.70
	<hr/>
	\$682,686.37

III. MEDICAL EDUCATION AND RESEARCH

China Medical Board

Development of Medical Schools in Peking and Shanghai.....	\$263,989.26
Assistance to Unaffiliated Medical Schools....	107,079.10
Assistance to Hospitals.....	48,968.75
Fellowships and Scholarships.....	44,515.39
Miscellaneous.....	36,869.22
Rockefeller Institute, Endowment and Current Ex- penses.....	3,127,913.68
	<hr/>
	\$3,629,335.40

IV. VARIOUS PHILANTHROPIES DESIGNATED BY THE
FOUNDER

Payments prior to July 19, 1917.....	\$942,251.42
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(The Founder, on July 19, 1917, relinquished all further right to designate the application of any part of the Foundation's funds.)

V. MISCELLANEOUS

(Chiefly payments on continuing pledges of earlier years)

American Academy in Rome.....	\$10,000.00
(Payment on ten-year pledge made in 1914.)	
American Social Hygiene Association.....	15,000.00
Bureau of Municipal Research.....	25,000.00
(Payment on five-year pledge made in 1915 for current expenses.)	
Committee on Scientific Research in Govern- mental Problems.....	9,500.00
(Payment on appropriations and pledges made in 1916.)	

SUMMARY OF EXPENDITURES

65

Committee on Reference and Counsel of Annual Foreign Missions Conference of North America.....	50,000.00
(Payment on ten-year pledge made in 1914 for correlating educational work in foreign fields.)	
National Committee for Prevention of Blindness (Payment on five-year pledge made in 1914.)	5,000.00
Study of Industrial Conditions.....	13,868.98
(Continuation of study begun in 1914.)	
New York Association for Improving Condition of the Poor.....	20,000.00
(Payment on ten-year pledge made in 1914 for demonstration of social relief measures.)	
Grand Chenier Bird Refuge, Taxes and Expenses (Taxes and expenses for tract purchased in 1915 and now held as a preserve under State Conservation Commission.)	1,619.52
	<hr/>
	\$149,988.50

VI. ADMINISTRATION

Maintenance of Executive Offices and Treasurer's Office.....	\$105,666.28
Purchase of Books and Furniture.....	2,189.86
	<hr/>
	\$107,856.14
	<hr/>
Grand Total.....	\$11,457,086.36

INTERNATIONAL HEALTH BOARD

Report of the General Director

To the President of The Rockefeller Foundation:

Sir:—

I have the honor to submit herewith my report as General Director of the International Health Board for the period January 1, 1917, to December 31, 1917.

Respectfully yours,

WICKLIFFE ROSE,
General Director.



Fig. 2—Activities of International

INTERNATIONAL HEALTH BOARD

OFFICERS AND MEMBERS

GEORGE E. VINCENT, *Chairman*
WICKLIFFE ROSE, *General Director*
HERMANN M. BIGGS
WALLACE BUTTRICK
SIMON FLEXNER
FREDERICK T. GATES
WILLIAM C. GORGAS
STARR J. MURPHY
WALTER H. PAGE
JOHN D. ROCKEFELLER, JR.
WILLIAM H. WELCH

EDWIN R. EMBREE, *Secretary*

PERSONNEL OF STAFFS DURING 1917

ADMINISTRATIVE STAFF

WICKLIFFE ROSE, *General Director*

JOHN A. FERRELL, M.D., *Director for the United States*

VICTOR G. HEISER, M.D., *Director for the East*

HECTOR H. HOWARD, M.D., *Director for the West Indies*

ERNST C. MEYER, *Director of Surveys and Exhibits*

FIELD STAFF

Alabama:	R. B. Hill, <i>Junior Field Director*</i>
Arkansas:	D. C. Absher, <i>Junior Field Director*</i>
	D. M. Griswold, <i>State Director**</i>
	H. A. Taylor, <i>State Director (Malaria Control)</i>
Brazil:	L. W. Hackett, <i>Associate Regional Director</i>
	J. L. Hydrick, <i>Associate State Director</i>
	Paez Azevedo, <i>Senior Field Director</i>
British Guiana:	F. W. Dershimer, <i>State Director</i>
	W. A. Forsythe, <i>Senior Field Director**</i>
Ceylon:	W. P. Norris, <i>Associate Regional Director</i>
	W. P. Jacocks, <i>Senior State Director</i>
	J. E. Snodgrass, <i>Associate State Director</i>
	S. A. Winsor, <i>Senior Field Director</i>
	F. W. Eastman, <i>Junior Field Director*</i>
China:	F. C. Yen, <i>Junior Field Director</i>
Costa Rica:	L. Schapiro, <i>Senior State Director</i>
	J. L. Rice, <i>Junior Field Director</i>

* In Military Service.

** Resigned.

Dutch Guiana:	W. H. Kibler, <i>Associate State Director</i>
Georgia:	M. E. Connor, <i>State Director</i>
Grenada:	H. S. Colwell, <i>State Director**</i>
Guatemala:	A. M. Struse, <i>State Director</i>
Fiji:	G. P. Paul, <i>State Director</i>
Louisiana:	E. W. Schultz, <i>Junior Field Director**</i>
Maryland:	W. G. Smillie, <i>Senior Field Director</i> G. K. Strode, <i>Associate State Director*</i>
Mississippi:	C. Cross, <i>Senior Field Director</i> F. A. Miller, <i>Junior Field Director</i> A. C. Pfeiffer, <i>Senior Field Director*</i>
Nicaragua:	D. M. Molloy, <i>Senior State Director</i>
North Carolina:	B. E. Washburn, <i>Senior State Director</i> C. A. Laubach, <i>Junior Field Director**</i>
Panama:	W. T. Burres, <i>State Director</i>
Papua:	J. H. Waite, <i>Associate State Director</i>
St. Vincent:	P. B. Gardner, <i>State Director</i>
Salvador:	C. A. Bailey, <i>State Director</i>
Seychelles Islands:	J. F. Kendrick, <i>Associate State Director</i>
Siam:	M. E. Barnes, <i>State Director</i>
Texas:	P. W. Covington, <i>Senior State Director</i> W. C. Becker, <i>Junior Field Director**</i>
Trinidad:	G. C. Payne, <i>State Director</i>

SPECIAL STAFF

Tuberculosis Work in France

Livingston Farrand, *Director*

James Alexander Miller, *Associate Director*

Selskar M. Gunn, *Associate Director*

Homer Folks (Representing the American Red Cross)

Yellow Fever Commission

William C. Gorgas, *Chairman*

Henry R. Carter, *Clinician*

* In Military Service.

** Resigned.

Juan Guiteras, *Clinician and General Adviser*

Theodore C. Lyster, *Clinician*

Eugene R. Whitmore, *Pathologist*

William D. Wrightson, *Sanitary Engineer*

Uncinariasis Commission to Orient

Samuel T. Darling, *Chairman*

Marshall A. Barber

Henry P. Hacker

Hospital Ship for the Philippine Islands

A. F. Coutant, *Physician in Charge*

Teresa McKimmey, *Nurse*

Adviser in Medical Education

Richard M. Pearce

THE YEAR IN BRIEF

The International Health Board is devoted to the work of preventive medicine in the United States and other countries. It cooperates with Government in measures designed to control hookworm disease and other diseases, and assists in the establishment of permanent agencies for the promotion of public sanitation and the spread of the knowledge of scientific medicine.

During the year 1917, notwithstanding war conditions, infection surveys were conducted in Tobago, Cayman Islands, and Papua, and demonstrations in the relief and control of hookworm disease carried on in 12 states in this country and 22 foreign states and countries. As a new departure, the Board took its first step in the direction of aiding in the control of hookworm disease in mines by conducting a preliminary infection survey of Pinghsiang Colliery in the Kiangsi Province of China. In close relations with the American Red Cross, the Board has cooperated with the French Government in measures for the control of tuberculosis in France. It conducted experiments in Arkansas and Mississippi for the purpose of testing measures for the control of malaria. Through its Yellow

Fever Commission it carried on survey work in Martinique and Venezuela, in connection with the eradication of yellow fever. It cooperated with the Philippine Government in placing in commission a hospital ship to bring medical and surgical relief to the inhabitants of the Sulu Archipelago. To provide an opportunity for adequate training in public health, it aided in the establishment of a Department of Hygiene in connection with the Faculty of Medicine at the University of Sao Paulo, Brazil. The Uncinariasis Commission which the Board appointed and sent to the Orient early in 1915, to conduct a scientific investigation with respect to the importance of hookworm disease as a disabling factor in Malaya, returned to America and made its report.

During the year there have been two outstanding developments: improvement in sanitation and increase in local support. Government officials have been very energetic in the matter of enacting and enforcing legislation aimed at the prevention of soil pollution, and public appropriations for the support and extension of the work have been greatly increased.

79.

PART ONE

CONTROL OF HOOKWORM DISEASE

I

MENACE OF HOOKWORM DISEASE

Fifteen hundred hookworms were found in the body of one laborer who had died from anemia while working on the St. Gotthard tunnel (Switzerland). This was in February of the year 1880. The post-mortem examination had been made by Colomiatti in the presence of many doctors and professors, including Perroncito. Perroncito was most active in the work of following up this discovery and eventually succeeded in demonstrating the parasitic origin of anemia in tunnels and mines. The tunnel project was begun in 1872 from both sides at once. At the start, 1700 laborers were employed on the North end. When the work was completed in 1882, all but 60 of the workmen originally employed on the project had been replaced. Doubtless a considerable proportion of this defection was due to the prevalence and malignancy of the disease. During the last few years of construction, probably 95 per cent. of the working force that had been at the tunnel for a year were infected. Two score years earlier (1838) Dubini had first discovered hookworms in the body of a peasant woman at the hospital of Milan.

CHARACTER OF THE DISEASE

Hookworm disease is communicable. It is caused by a small parasitic worm (*Uncinaria*), about as thick as an ordinary pin and about half as long. Thousands of them may live in the intestine of a single person: in one case more than 6,000 hookworms were passed by a patient as a result of treatment. While the female produces immense numbers of eggs, these never mature within the host, but must leave the body with the feces before they can hatch. Under proper conditions of air, heat, and moisture, they hatch within the brief space of from 24 to 40 hours. When once hatched, the larvae, or young hookworms, too small to be seen with the naked eye, may live on and near the surface of the ground for many months, and so long as they stay in the soil they remain microscopic in size. They get back into the body by boring through the skin of the bare feet and hands or other portions of the body which come in contact with soil in which they exist, and thus pass into the circulating blood of the human host. Their entrance through the skin causes an itch which has come to be known as ground itch. After boring through the skin they enter the lymphatics, are carried through the heart, penetrate the lungs, make their way to the throat and are

swallowed, after which they ultimately reach the small intestine. Here they grow to maturity and remain for seven years, or more, if not disturbed by treatment.

EFFECTS OF THE DISEASE

These parasites nourish themselves by sucking the blood of the host and perhaps cause changes in the blood which tend to destroy the hemoglobin. Whatever the process, severe infections are followed by severe anemia. Moreover, persons harboring this infection seem to be more susceptible to diseases such as malaria, typhoid fever, pneumonia, and tuberculosis. In the military cantonments it has been clearly shown that the incidence of pneumonia is much higher among Southern than Northern troops, and also that the mortality rate is higher among Southern troops. Specifically, a recent report of the Surgeon General of the United States Army¹ shows that of two regiments recruited from two Gulf States, hookworm infection was found in 54 per cent. of the men examined in one command, and in 32 per cent. of those in the other. An unusually large mortality, due to measles and lung and bronchial troubles, was reported in these regiments after a recent

¹ Report for 1917, page 131.

epidemic. Measles occurred more frequently (ratio, two and one-half to one) in men who had hookworm disease. Measles patients, who suffered also from hookworm disease, were twice as susceptible to pneumonia and kindred diseases as men free from intestinal infection. It therefore appears probable that hookworm infection, by reducing individual resistance, is a very important predisposing factor in the acute infectious diseases prevalent in army camps.

Hookworm disease is never spectacular like yellow fever or pernicious malaria. And for this very reason it is the greater menace. Acute diseases sometimes tend to strengthen the race by killing off the weak; but hookworm disease, working so insidiously as frequently to escape the attention even of its victims, tends rather to debilitate the race by attacking the strong as well as the weak. The cumulative effects of the disease on the race—physical, economic, intellectual, and moral—which are handed down from generation to generation through long periods of time, are even more important than its contribution to the death roll among individuals. This one disease, where the infection is practically universal, may go far towards explaining the retardation of backward peoples.

EXTENT OF THE DISEASE

There is no doubt that for centuries before Dubini discovered the cause of the disease, and thus pointed the way to its control, it had been prevalent as a distressing and disabling factor among the inhabitants of tropical and sub-tropical countries in the zone which lies between parallels 36° north and 30° south. More than one-half the population of the earth live in this zone. The degree of infection in the countries where the disease prevails varies considerably. Some idea of its severity may be gathered from the figures of a number of infected regions. In one district in the tea gardens of Assam, in the Ganges River Valley of India, examination of 600 persons showed an infection of 99.9 per cent. The infection among the rural population of the plains of India probably averages 80 per cent. Examination in 1910, of nearly 3,000 persons in the Amazon region of Brazil, showed an infection of approximately 88 per cent. It is conservatively estimated that in the Yangtze Valley region of China, 90 per cent. of the farmers are infected. The average percentage of infection for those areas of Ceylon, Fiji, Seychelles, and Siam in which the Board has carried on operations is 93.1 per cent. For Ceylon alone it is 97 per cent. The work of the Board in



Fig. 3—World-wide Distribution



of Hookworm Infection

Central America indicates an average infection of 63.3 per cent. The average infection in the West Indies is 60.9 per cent.; for Dutch Guiana it is more than 91 per cent.

These facts and figures, indicating the extent and severity of hookworm disease, suggest that the menace is international in character and that the question of its control is, therefore, one of international concern.

II

INFECTION SURVEYS

Preliminary infection surveys are conducted in all countries and communities where work for the control of hookworm disease is contemplated. These surveys, by making available information both as to the geographical distribution of the infection and the degree of infection for each infected area, give the basis for the formulation of a working program. Similar surveys, conducted from time to time, help to give a definite measure of progress in the work of control. (See Fig. 4, page 90.) A number of such surveys were carried on or brought to a close during the year. The infection survey of Rio de Janeiro, which led to the initiation of similar undertakings by other states in Brazil, and the infection survey of the Pinghsiang Colliery in the Kiangsi Province of China, are described in other parts of this report.

SURVEY OF PAPUA

An infection survey of Papua, under the Government of the Commonwealth of Australia, conducted from June 1 to September 1, 1917,

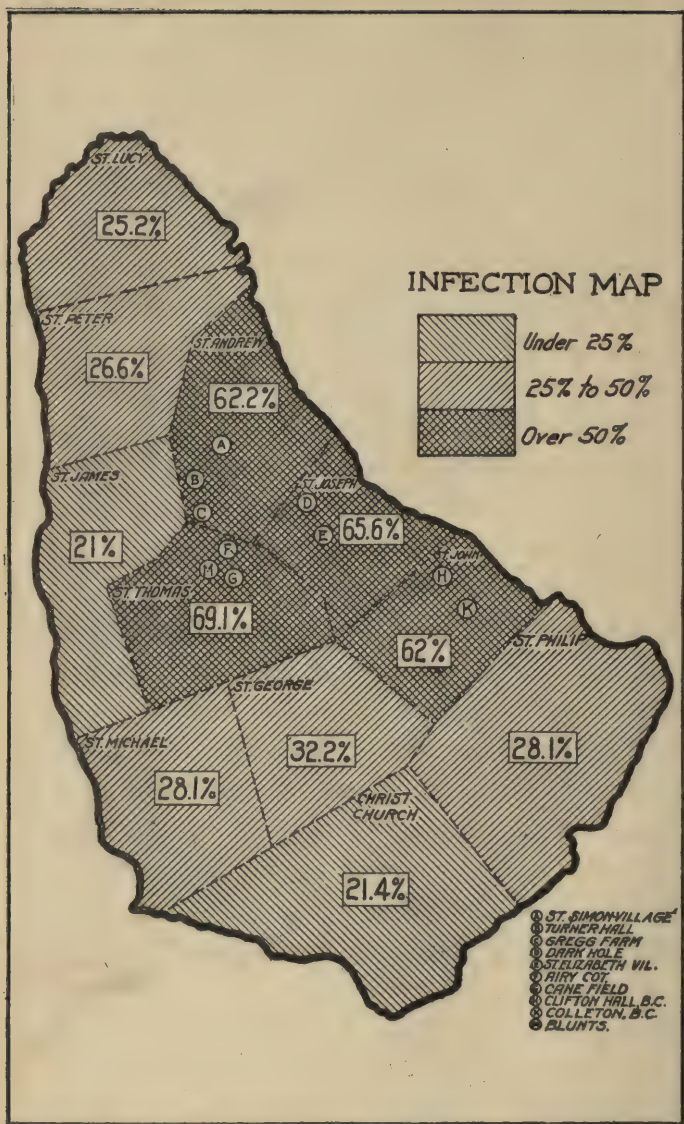


Fig. 4—How Infection Survey Defines the Problem and Locates the Regions of Heaviest Infection. Barbados

shows the influence of commercial development in spreading the disease through native populations. Until the plantations were opened in Papua, gross clinical symptoms of the disease were not reported. The concentration of large numbers of laborers on the plantations, without adequate measures being taken to prevent soil pollution, permitted the infection to spread and to increase in severity. The return each year of 6,000 plantation laborers to the villages, following their periods of indenture on the estates, affords many opportunities for the village natives to acquire the infection.

That this is what actually happens is attested by the fact that in the survey a rate of infection of only 8.5 per cent. was found among village natives none of whom had ever worked on or visited a plantation, as compared with an average rate of 61 per cent. among natives who had. As the length of service on estates increases, the rate of infection rises, as is indicated in Fig. 5, page 92. The climatic conditions and the insanitary habits of the people of Papua, both on the plantations and in the villages, are exceedingly favorable for the spread of the infection.

Following the survey, the Government undertook the organization of a permanent health service for the colony. This service will include an ocean-going boat, with a health officer in

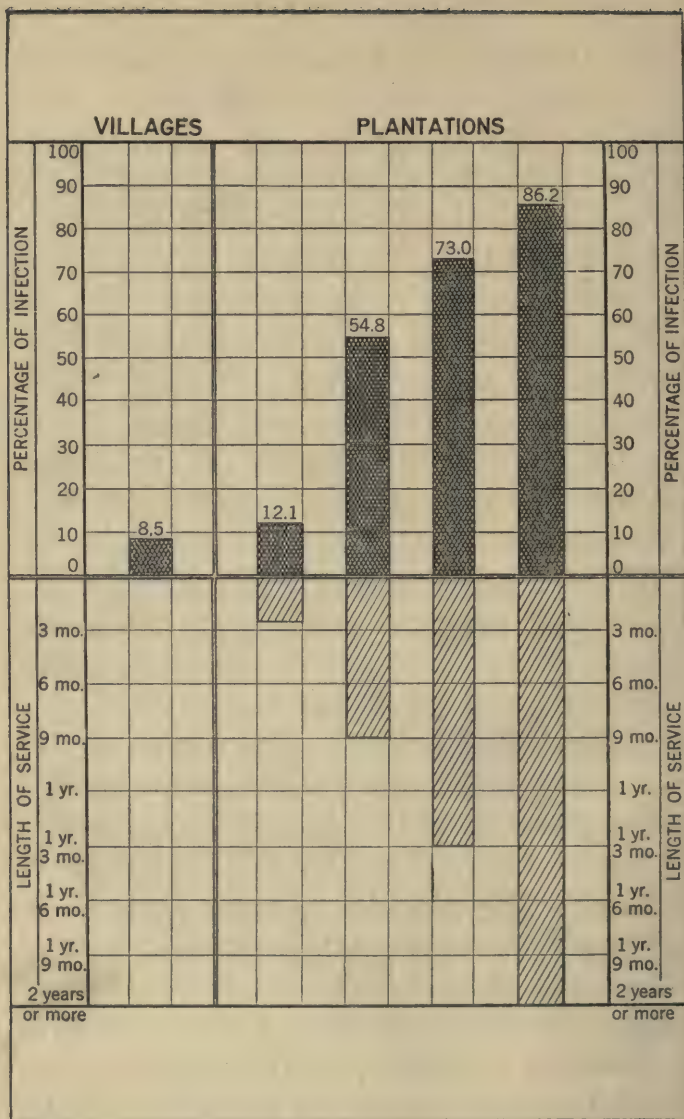


Fig. 5—Relation Between Length of Plantation Service and Rate of Hookworm Infection. Papua

charge, designed to bring relief to outlying districts inaccessible by land. The service also contemplates, as soon as practicable, the inauguration of active measures for the control of hookworm disease. A preliminary appropriation of approximately \$5,000 has been provided by the Government for this purpose.

As a result of the preliminary work done in Papua, the Government of Australia has invited the Board to cooperate with the health department of Queensland in carrying out a demonstration in the control of hookworm disease in that state. An appropriation of approximately \$7,500 has been made by the Government as its share of the expense of the first year's work.

SURVEY OF TOBAGO

An infection survey of Tobago, a dependency of Trinidad, established a fairly uniform rate of infection throughout the different parishes, with little variation due to topography, cultivation, river courses, or soil formation. This even distribution of the infection has probably resulted from the fondness of the natives for traveling on foot from one part of the island to another. In the course of this survey, 2,414 persons were examined among a total population of approximately 22,142, and 63 per cent. of

those examined were found infected. Most of the people examined lived in the vicinity of large towns and villages. The degree of individual infection was found to be fairly heavy.

SURVEY OF CAYMAN ISLANDS

An infection survey of the Cayman Islands, British West Indies (a dependency of Jamaica), was conducted during the spring of 1917. The work was undertaken at the request of the Government of Jamaica. The combined population of the three islands composing this group—Grand Cayman, Cayman Brac, and Little Cayman—is 5,250. In the survey 1,340 persons were examined, of whom 228, or 17.0 per cent., were found infected. In Grand Cayman, the average rate of infection was 20 per cent., with a variation ranging from three to 55 per cent. in different parts of the island. In Cayman Brac, it was eight per cent., with a variation from two to 14 per cent. No infected persons were found in Little Cayman. The rate of infection was highest in the towns lying nearest the mangrove swamps of which the eastern parts of both Grand Cayman and Cayman Brac are largely composed. The proximity of these swamps, with their density of shade-growth, bears an important relation to the percentage of infection in the towns.



Fig. 6—Type of Native Houses. Tobago

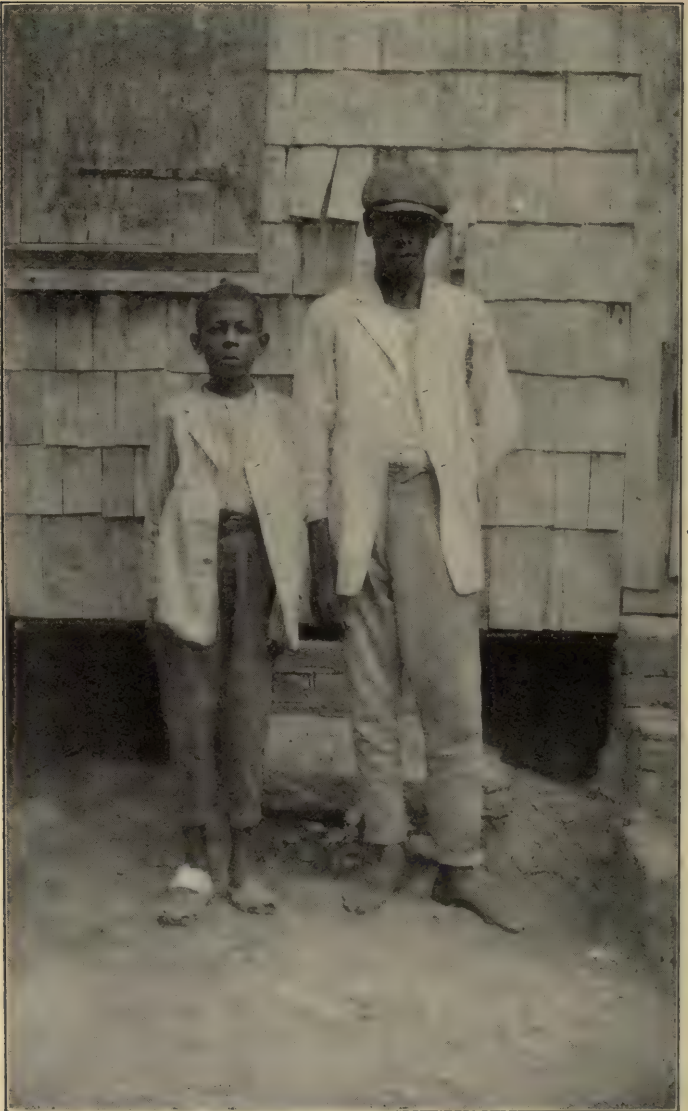


Fig. 7—Two Boys of Same Age. One on Left Heavily Infected with Hookworm Disease. Hemoglobin 50; Ulcer on Right Foot for Seven Years. Tobago

Elsewhere throughout the islands the infection has not taken a firm foothold. Because of the lack of shade and moisture in those portions of the islands that are formed of coral rock, there is little likelihood of the disease being widely spread. The enforcement of satisfactory regulations governing the disposal of human excrement, and the attention paid in the Government schools to the teaching of hygiene and sanitation, also play their part in preventing the further spread of the infection.

Following the survey of the Cayman Islands, the Government of Jamaica voted an appropriation of approximately \$12,000 for the purpose of initiating a campaign, in cooperation with the Board, against hookworm disease in the Island proper. It was understood and agreed that the Board would make an infection survey. The Board further agreed that, if the survey should reveal conditions calling for systematic measures for relief and control, it would conduct demonstrations in a few selected areas. The Government, for its part, agreed to supply the necessary drugs and printing, and to organize, as soon as might be practicable, a sanitary department under central administration. The Government further agreed that, if relief measures should be undertaken, the areas in which the work would be done would be supplied with latrine accommodations in advance of the examination and treatment of the people.

III

PLANS OF OPERATION

In the progress of the work two plans of operation for control have been developed. One is known as the dispensary plan; the other as the intensive plan. In the first plan, the work of examining, treating, and educating the people centers around the free traveling dispensary, and has the advantage of covering large areas and of reaching large numbers of people in a comparatively short time; in the other plan, the work is limited for a definite time to a restricted area, and has the advantage of greater thoroughness in detail.

DISPENSARY PLAN

The dispensary plan provides for the organization of mobile dispensaries which visit periodically those towns and villages that are most conveniently located. They offer free examination and free treatment to all who apply. The staff (a physician and a corps of assistants) is equipped with microscopes, specimen containers, hemoglobinometers, the necessary drugs, record forms, camera, lantern and slides, charts, leaflets, and a

supply of exhibit material for conducting effective educational work. The dispensary does not undertake to examine the whole population, but only those people who apply. It dispenses drugs to those who need and desire treatment, but does not administer treatment under direct supervision. It is true that it cannot follow up its first treatments with continued reexamination and re-treatment until cure has been demonstrated, nor does it remain in one place long enough to effect conspicuous results in sanitation which can be measured and recorded as definitely accomplished. Nevertheless, experience has shown that the dispensary is an effective means of bringing speedy relief and definite instruction to large numbers of people distributed over wide areas of territory.

Diagnoses are by microscopic examination of the feces, the presence of infection being determined by the presence of eggs of the parasite in the patient's stool. The field director is given as many microscopists as are needed to do the work. By the dispensary plan of operation practically the whole infected area of 11 Southern States was covered in a period of three years, 750,000 persons were treated, and 20,000,000 people were educated both as to the importance of the disease and as to efficient measures for its relief and control.

INTENSIVE PLAN

The purpose of work by the intensive plan is to demonstrate the possibilities of a direct and definite attack upon a prevailing disease. The hope is that such temporary measures as are brought into use for the relief and control of hookworm disease may be in the nature of a first step toward the establishment of permanent agencies which shall in time apply similar or better methods to the control of all diseases. The most effective work, therefore, is that which succeeds in creating so keen a realization of benefit that the public is prepared not only to cooperate in further and more comprehensive undertakings of similar nature, but to insist that permanent agencies be established to continue and enlarge the work.

By the intensive plan, an attempt is made to approximate complete relief and control of hookworm disease within a given area. Trials with this method in Peter's Hall District, British Guiana, and in other selected areas, definitely established it as the prevailing type. Under this plan, a territorial unit of operations may be a county, or it may be any small, well-defined area containing from 1,000 to 15,000 people. For purposes of convenience and efficiency in practical administration, the large unit areas are divided into a number of small districts.



Fig. 8—Group Assembled for Treatment, Coffee Plantation, Guatemala



Fig. 9—Community Clinic for Treatment of Hookworm Disease. Ceylon

SCHEME OF ORGANIZATION

The scheme of organization which has proved most satisfactory for conducting operations provides for two staffs. One of these staffs—the one which is in part financed by the Board—devotes itself to the work of examining, treating, and educating the people. This staff usually consists of a doctor in charge, who is called the field director, two clerks, four microscopists, 12 nurses, and one or two caretakers. The other staff—the one which is supported by the Government—devotes itself to the task of introducing and maintaining the necessary sanitary measures designed to put a stop to soil pollution and thus prevent reinfection. The one is essentially a temporary organization; the other is permanent. While both staffs work under the authority of the Government and under the general supervision of the department of health, it has been found desirable to keep the two organizations distinct. The staff that examines and treats the people, and which for that reason works with a minimum of friction, is able at the same time to educate them to an understanding of the sanitary needs, thereby making it possible for the other staff to carry out its work with less necessity for compulsion. Another advantage of this plan of organization is that it provides

opportunity for Government to build up its permanent sanitary organization gradually, as the work advances from area to area, and as a sustaining public sentiment is developed.

The work to be carried out involves mapping the district (locating roads, streams, and houses), taking a census of the population (numbering the houses in which the people live, recording name, age, sex, race, and post-office address), making microscopic examination of the entire population, administering treatment to all persons found to be infected, and continuing treatment of each patient until cure is effected. While this work is in progress the people are taught the essential facts, both as to the nature of hookworm disease and as to methods of control. This is done by personal instruction in house-to-house visits, by the distribution of pamphlets and leaflets, and by illustrated lectures. In all this work, chief emphasis is placed on the prevention of soil contamination.

EFFECTIVENESS OF CURATIVE WORK

Although it is seldom possible to examine every resident of an intensive area, or to treat until cured every person found infected, the cooperation of the people has made it possible to maintain very high average results. In St.

Vincent the entire population of one area (more than 2,500 inhabitants) was examined, while the percentage examined of the total population of this and eight other areas in the same island was 99.6. Only 77 persons out of a total population of 20,390 refused to be examined. For the West Indian colonies as a whole, during the three and one-half years that intensive work has been in progress, a total of 165,099 persons have been enumerated in the census, and of this number only 1,124, or seven-tenths of one per cent., refused to submit specimens for examination.

The number of cures ranges from 75 per cent. to 90 per cent. of the number of persons infected. In no area has it been found practicable to demonstrate, by microscopic examination following treatment, that 100 per cent. of the infected persons had been cured. There is always a small remnant who, for medical reasons or because of refusal to begin or continue treatment, remain uncured in the areas at the close of the work. In Fiji and the Seychelles Islands, in the All Saints district in Antigua, and in the Bogawantalawa area in Ceylon, more than 90 per cent. of the infected persons were cured. Eliminating from consideration the group that, for medical reasons, could not be treated, the percentage cured in these four areas was approxi-

mately 95. There is no way, during the progress of the work, to cure the persons who for medical reasons are not treated, because these include emaciated persons, pregnant women, and sufferers from acute heart or kidney affections or other debilitating causes which would make treatment hazardous.

For all the West Indian colonies combined, only 17 per cent. of those originally infected remained behind as carriers of infection. Persons who, for medical reasons, could not be treated accounted for approximately one-fourth of those uncured, the remaining three-fourths being about equally divided between those who refused to take or to continue treatment, and those who had been treated once or oftener but had not yet been cured when the work was moved to other areas. Statistics show that refusals to be treated until cured, although more frequent than refusals to be examined, are met with, on an average, in six per cent. of the infected cases. In Fiji, among the 3,088 persons so far found to be infected, not one refusal to take or to continue treatment has yet been recorded.

EFFECTIVENESS OF SANITARY WORK

The most important of the many results of intensive work is the permanent sanitary im-

provement which it effects. In 66 of the 303 communities in the Southern States in which this type of work was conducted up to December 31, 1917, not a home was left without a latrine. Embraced within the boundaries of these 66 communities were 7,738 homes, of which 5,885, or 76 per cent., had latrines when the work started. When the work was finished the percentage of homes with latrines had been raised from 76 to 100. Many homes credited with having latrines at the beginning of the work had the open-back, open-seat type which does not prevent soil pollution. During the progress of the work almost all of these were changed to latrines either of the pit type or of some other type approved by the health authorities of the respective states. Only 61 per cent. of the 32,468 homes inspected in all of these 303 communities had latrines of any kind when the work began; when the work was concluded 82 per cent. had improved latrines. In the Seychelles Islands, in district No. 2 of the South Mahe area, every one of the 740 homes now has a latrine, although only seven were so equipped when the work began. In district No. 2 of the Central Mahe area, embracing 553 homes, all but six now have latrines, although only 15 had them when the work began. In Guatemala, during the third quarter of the year, 761 new

latrines, each accommodating from 12 to 20 persons, were installed. These latrines were sufficient to supply accommodations for 11,519 persons, or 96 per cent. of all those living within the areas of operation.

HOW INTENSIVE WORK IS CARRIED OUT

Although in each state or country the intensive work is limited to one small area at a time—in order to permit the staff to concentrate its energies on these small areas until they are completed—the work is nevertheless projected in such manner that eventually the whole area of the country, or the whole of its heavily infected territory, will be covered. The map of Costa Rica (See Fig. 10, page 109) illustrates how this is done. In interpreting this map it should be borne in mind that the extent of territory covered during any one year depends on the density of the population and the facilities for travel and communication within the areas. The large amount of territory marked to be covered during the year 1920 does not mean that the work during that year will necessarily be on a larger scale than during former years, but that the staff will be working in regions which have fewer inhabitants. Nor should it be inferred from this map that it is customary to cover

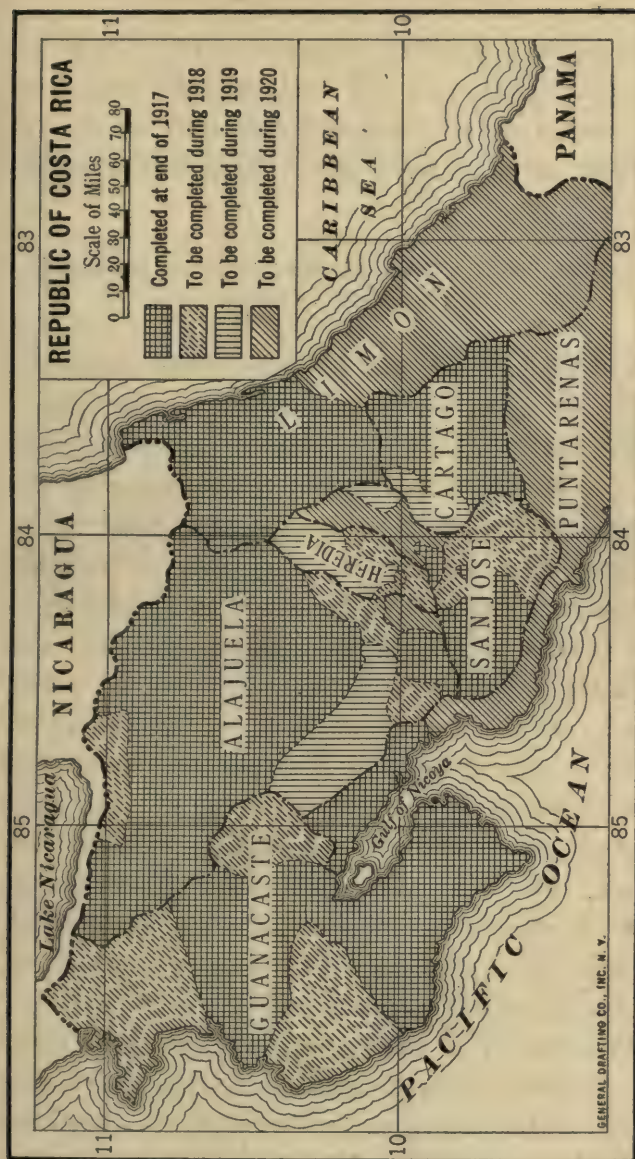


Fig. 10—How Hookworm Activities are Planned and Carried Out, Costa Rica

the whole territory of every country in which work is conducted. Where the infection is not so widespread as in Costa Rica, the work may be planned to omit the regions of lightest infection.

DEVELOPMENT FROM DISPENSARY TO INTENSIVE PLAN OF WORK

The best results are obtained from the intensive plan when the people understand something of the nature of the disease and have some realization of its importance. Experience in the Southern States has demonstrated that favorable public sentiment is a necessary prerequisite to successful intensive work. The dispensary—by means of lectures, demonstrations, and striking examples of the improvement in health which results from treatment—provides a convenient vehicle for carrying this knowledge into remote regions of infected countries, and goes far towards creating this favorable public sentiment. For this reason it is often an advantage in new countries to have the work conducted, at least for a limited time at its beginning, according to the dispensary plan.

The history of the recent work in Siam, as in the Southern States, Trinidad, Grenada, Costa Rica, and Nicaragua, affords an instance of activities originally beginning by the dispensary

plan of work and gradually developing into the intensive method of control. The work was started in Siam early in 1917 by the installation of an exhibit at the provincial exposition held at Bangkok. This exhibit served to awaken a lively interest in the subject of hookworm disease and its treatment, and in the possibility of controlling other diseases suggested by the measures employed against hookworm disease. It is estimated that at least 5,000 persons, including members of the royal family and many public officials, saw the exhibit during the six days of the Fair.

At the close of the exposition a dispensary was established in Chiangmai, a city in the northern part of Siam. Here soldiers, school children, prisoners, and inmates of leper colonies, as well as the residents of Chiangmai and surrounding villages, were examined and treated. The influence of this initial work, soon spreading into towns and villages far removed from the center of operations, led to requests that staff members be sent to examine and treat the inhabitants. In this way large numbers of people became acquainted with the nature of the disease and many of these expressed themselves as anxious to cooperate in conducting campaigns for its control. Meanwhile, at intervals during the year, ten areas in Chiangmai were opened on

the intensive plan, and by the close of the year the major part of all the work was becoming intensive in character.

The distinguishing characteristic of the intensive plan of operations is that it is a practical demonstration, in a limited area, of the possibility of controlling hookworm disease in all infected areas. At the same time it serves to point the way towards the ultimate control of other preventable diseases by similar methods of direct attack. Its employment usually results in the enactment of legislation for the prevention of soil pollution¹ and involves the appointment of a number of sanitary inspectors whose duty it is to see that the regulations are enforced. These inspectors furnish the nucleus of a permanent sanitary staff whose efforts, although in the beginning directed primarily against hookworm disease, may in course of time be extended to include the application of measures designed for the control of other diseases as well.

¹ During 1917, laws for the prevention of soil contamination were enacted by Dutch Guiana, Nicaragua, Guatemala, Fiji, the Seychelles Islands, the Federal District and the States of Rio de Janeiro and Sao Paulo in Brazil, and by certain towns and counties in the Republic of Salvador and in the States of North and South Carolina.

IV

TREATMENT FOR HOOKWORM DISEASE

The war against hookworm disease may be described as a series of offensive campaigns, or drives, in which the immediate objective of treatment is the relief of the patient and the ultimate objective such sanitary reform as will bring permanent control. It has not been found practical to begin by enacting measures of regulation. The people must first be convinced of the necessity of such legislation, and experience has shown that actual treatment offers the line of least resistance in the education of the people.

DRUGS USED IN TREATMENT

In recent years many remedies have been given a trial in the treatment of hookworm disease. Thymol and chenopodium stand out as being much more efficacious than any of the others. There is considerable difference of opinion among men of large experience as to whether thymol or chenopodium is the better drug to use.

During the year much information relating to the use of oil of chenopodium in the treatment of hookworm disease has become available.

The directors of the work in Fiji and in the Seychelles Islands have used this drug exclusively in treating more than 13,000 cases, and in their experience have met with scarcely an untoward symptom. Seventy-three per cent. of the persons treated in the Fiji Islands were cured by two treatments. On reexamination, six months after the original treatments were given, only 10 per cent. of these patients were found to be infected. The Board's Uncinariasis Commission to the Orient showed, under experimental conditions with a comparatively small number of cases, that one treatment of chenopodium had an efficiency, based on the proportion of worms removed to worms harbored, of 96 per cent., as compared with an efficiency of 89 per cent. for thymol, of 47 per cent. for eucalyptus, and of 27 per cent. for Beta-naphthol.

SMALLER DOSAGE OF CHENOPODIUM RECOMMENDED

In Ceylon, Panama, Dutch Guiana, Brazil, and a number of other countries, alarming symptoms, or death, have sometimes followed the administration of chenopodium. Apparently the dosage heretofore recommended in the literature is too high. The Uncinariasis Commission found that the efficiency of 99 per cent. obtained by a single treatment of cheno-

podium, consisting of three mils of the oil, divided into three doses and administered at hourly intervals, was reduced to only 95 per cent. when the dose was cut in half; while two of the half-dose treatments, administered with at least ten days intervening, produced an efficiency, in 39 cases, of 99 per cent. When the smaller dose was used untoward after-effects were rare. This experience led the Commission to recommend 1.5 mils of chenopodium, divided into three doses of 0.5 mil each, as the standard treatment for hookworm disease. In routine practice a light meal was given on the evening before treatment. This was followed by a purgative dose of magnesium sulphate. A very light breakfast, consisting of milk, or konje, was given on the morning of treatment. The regular dosage was a half mil, or 8 minims, of chenopodium at 7:00 A. M., followed by similar doses at 8:00 A. M. and at 9:00 A. M. At 11:00 o'clock a purgative dose of magnesium sulphate was again administered. It is declared, in some quarters, that when castor oil is used as a purgative the number of cases of poisoning is reduced. The experience of the Commission, however, shows that magnesium sulphate is a safer and more efficient purgative than castor oil.

During the latter months of the year the

smaller doses of chenopodium were used in many countries, with a decided decrease in the number of cases of poisoning. An analysis of the cases of poisoning, following treatment, which have been brought to the attention of the Board, shows that only one-fourth were among persons more than 12 years of age, while of the three-fourths occurring in children under this age more than one-half were among children less than seven years old. This suggests that the proportionate reduction in children's doses, as arrived at by Young's rule, may not be sufficiently great, and that the advisability of smaller proportionate doses should be seriously considered.

Experience would therefore seem to warrant the conclusion that the maximum doses of chenopodium recommended in the literature are unsafe. However, oil of chenopodium has such great anthelmintic value, not only for hookworm but for ascaris and other parasites, that the desirability of discovering methods for its safe employment justifies additional effort.

POST-CAMPAIGN MEASURES AND FEWER TREATMENTS

Arrangements have been made with the Government and planters of Ceylon for carrying out post-campaign measures on all estates on which the work of treatment has been completed.



Fig. 11—Coolie Girl Before Treatment for Hookworm Disease. Dilated Abdomen. Ceylon



Fig. 12—Same Girl After Treatment. Abdomen Much Reduced. Facial Expression Brighter



Fig. 13—Coolie Woman Before Treatment for Hookworm Disease. Age, 30; Weight, 68 Pounds; Small in Stature; No Appetite; Unable to Work; Hemoglobin 25. Ceylon



Fig. 14—Same Woman After Treatment (interval four months). Weight, 78 Pounds; Appetite Much Improved; Able to work Without Exhaustion; Hemoglobin 65

These measures will continue for a period of 18 months following the close of the initial demonstration on each estate, and will be under the supervision of a Government medical officer, assisted by microscopist-dispensers, trained in regular campaign work. At the end of the 18 months' period of organized post-campaign measures, the estate dispensers will be expected to handle the situation, which will consist mainly of the treatment of small groups of new laborers coming to the estates from time to time.

In an attempt to relieve the laborers from the ill effects of continued purgation and treatment in obstinate cases, the plan of administering not more than four treatments to any patient, and of depending upon post-campaign measures to complete the cure of those remaining infected, was carried out on two estates in the Matale area which had not been provided with latrines. On one of these estates, 86 per cent. of the infected persons were cured by four or fewer treatments; on the other, all those medically fit for treatment were cured. The method of administering a small number of treatments and of depending upon post-campaign measures to complete the cure of cases which remain infected, is of course more economical than the plan of treating each patient until he is cured. The plan will be given further trial during 1918,

TREATMENT OF EMIGRANTS OVER-SEAS

It has become evident that hookworm infection is being extensively carried into Ceylon, Malaya, Fiji, the West Indies, and other parts of the globe by emigrant laborers from Southern India. With the idea of preventing, if possible, the spread of the disease in this manner, the Trinidad Government, late in 1915, undertook to see that laborers coming to Trinidad from India were, upon arrival, free of hookworm infection. To this end, the expedient was tried of treating on shipboard, during the voyage from Calcutta to Trinidad, all laborers suspected of being infected. The report of the first voyage on which this plan was carried out is interesting as showing what can be accomplished by this means toward checking the spread of infection into particular countries.

Once each week for four successive weeks, without preliminary microscopic examination, 594 of the 660 laborers on board were treated. The only ones not treated were infants and pregnant women who were unable to take treatment. All but six of these 594 patients were examined after they had taken four treatments, and 508 were found negative. The voyage terminated before the other 80 patients (13 per cent. of the total treated) could be freed of

the infection. As indicating the rate of infection that might have been expected among these laborers but for the measures of relief, 17 pregnant women who could not be treated were microscopically examined on arrival and all but one were found infected.

ECONOMIC RESULTS OF TREATMENT

Maximum efficiency, both of machines and of men, is necessary as a war measure; hence every belligerent country is putting forth every effort to eliminate waste and to increase production. After the war, during the period of reconstruction, there will be even greater need for economizing the resources both of wealth and of health. The economic significance of uncinariasis as a disabling disease is therefore highly important. Some indication of this economic significance is suggested by the following examples of increase in hemoglobin index following treatment, for there is, of course, a close relation between working efficiency and the degree of anemia.

In Porto Rico, by treating the people who came voluntarily to the dispensaries, the general average of the hemoglobin index, as estimated for the total population over a large area where the test

was made, was raised from 43 in 1904 to 72 in 1914.¹

In Dutch Guiana, hemoglobin tests were made of a group of 711 infected persons before they had been treated, and again six months or more after they had been treated. These tests showed that the average percentage of hemoglobin in the group was 71 before treatment and 90 after treatment. (See Fig. 15, page 123.)

In Costa Rica, hemoglobin tests of 18,172 infected persons before treatment showed an index of 62. After treatment for hookworm disease, the index of 6,451 of these persons was 75. The index for a group of 8,815 persons found uninfected on first examination was 73. (See Fig. 16, page 124.)

The laboring incapacity of the prisoners in the Sapele prison, Nigeria, was reduced within a period of nine months from 37 per cent. to five per cent. by the examination of the 150 inmates, by the treatment of those found infected, and by strict enforcement of sanitary measures.²

Lieut.-Col. Clayton Lane, of the Indian Medical Service, has estimated that although the treatment and cure of hookworm disease in the laboring population of India should increase its

¹ Preliminary Report, Institute of Tropical Medicine and Hygiene of Porto Rico, 1914. Page 12.

² Manuscript Report *Ankylostomiasis in Nigeria*, Thomas Blane Adam, M.D. Page 15.

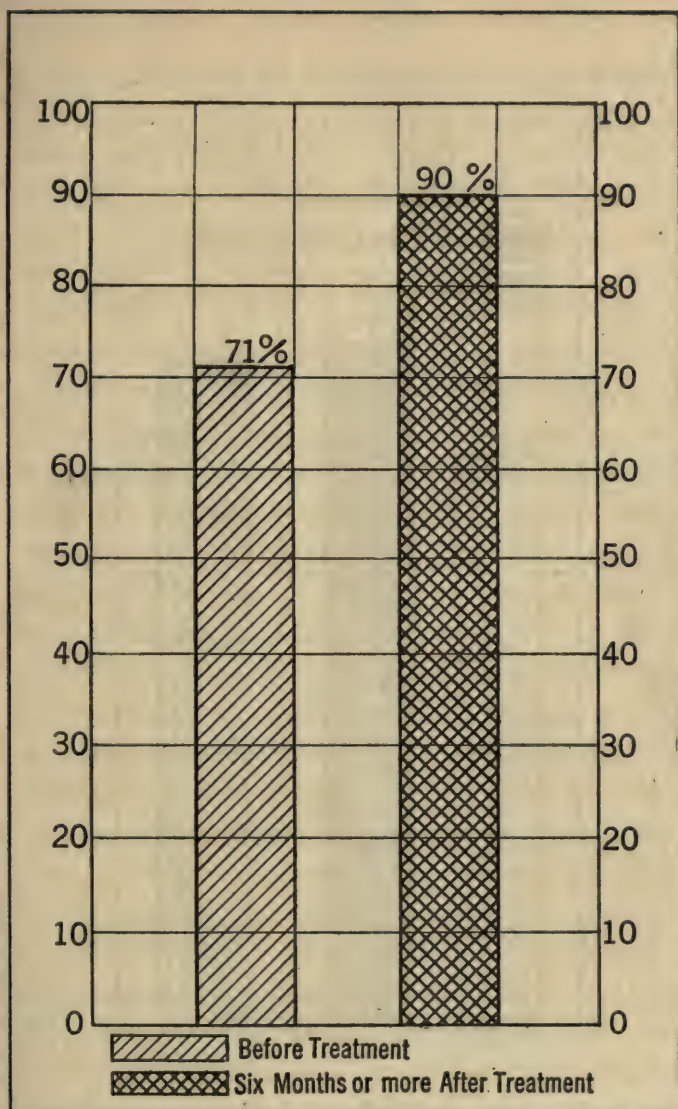


Fig. 15—Increase in Hemoglobin of 711 Persons Treated for Hookworm Disease. Dutch Guiana

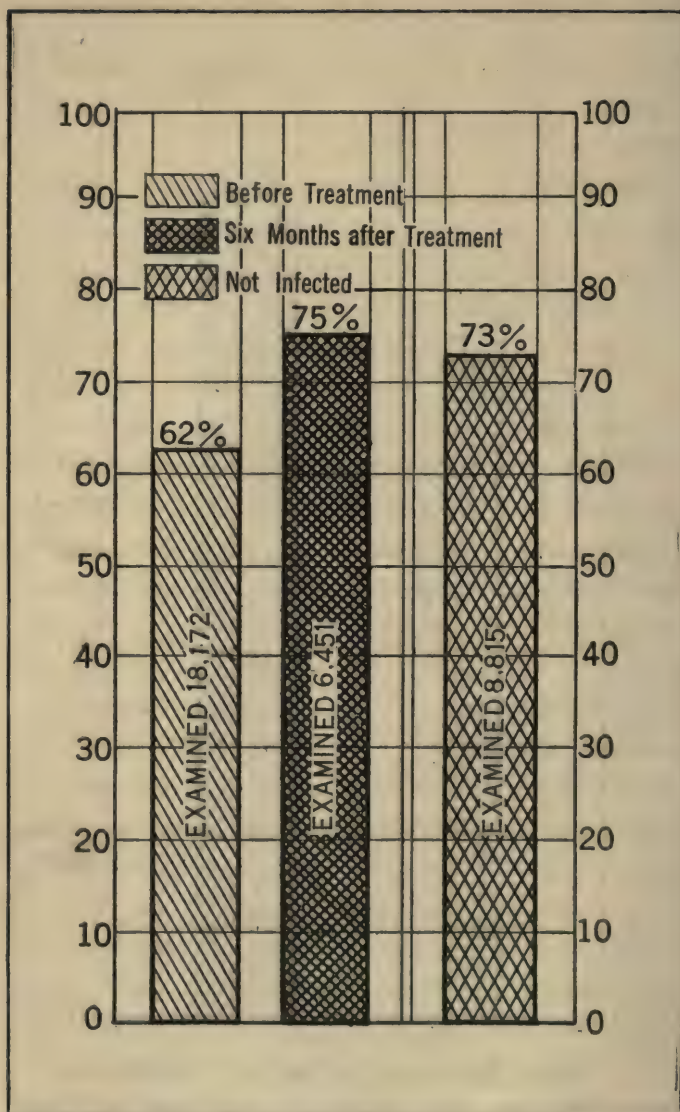


Fig. 16—Hemoglobin Index of Infected Persons Before and After Treatment Compared with Index of Persons Not Originally Infected with Hookworm Disease. Costa Rica

working capacity by only ten per cent., a gain of more than 30 millions sterling would result in India each year.

TREATMENT AS A MEANS OF EDUCATION

Worthy as would be the endeavor to relieve the physical suffering and increase the personal efficiency of those who are afflicted with hookworm disease, it cannot be said too plainly, nor repeated too often, that the most important objective is to educate the people of an infected community or country, both as to the cause of the disease and as to the means of preventing it, so that they themselves, with the aid of Government, will initiate and maintain those primary reforms in sanitation that will ensure permanent control. There is no more effective means of popular education on this subject than systematic treatment. When properly conducted, the work of treatment teaches the people by demonstration what the disease is, and what it means to them as a menace to their health and working efficiency. Moreover, it teaches them how they get it and how they can prevent it. Thus it enlists their interest in carrying into effect the necessary sanitary measures that will guarantee prevention.

It may therefore be said that the work of

treatment is essentially educational. The field directors, in the course of their routine labors, tell the story of hookworm disease to the people in simple terms and in varied graphic forms. Pulpit and press are both enlisted and large use is made of pamphlets, leaflets, and circular letters. Among the natives in many of the tropical countries the story must be presented in the most direct and concrete terms. Among these primitive people the field directors rely largely upon telling the story by word of mouth, and as they tell it they illustrate its details by means of lantern slides and photographs. Typical cases are used as object-lessons and gross clinical symptoms pointed out. Specimens of the patients' stools are shown, and the eggs of the parasite exhibited under the microscope. The parasites actually expelled by treatment are also shown, as are the living, squirming embryos that live by teeming thousands in the soil that has been befouled by an infected person. The recovery that follows treatment and cure tells its own story, both to the patient and to his friends and neighbors. The disease thus lends itself so readily to simple demonstration that even the ignorant natives of tropical countries easily understand its whole story.

Moreover, the relief and control of hookworm disease is an object-lesson in the relief and control

of disease in general. Having seen this one disease brought under control and having had the worth of the effort brought home, people are prepared to give heed when spoken to about diseases that are not so easily controlled. This is the principal reason why the funds and labors of the International Health Board have been, for four years, devoted so largely to efforts looking toward the control of hookworm disease.

TREATMENT AS A MEANS OF CONTROLLING HOOKWORM DISEASE

That systematic treatment for hookworm disease is efficacious in reducing the degree of infection has been repeatedly demonstrated. Pending the completion of studies now in progress, no definite statement as to the amount of reduction in infection following treatment in the Southern States is warranted. Figure 17, page 128, compares, for the 48 counties in those States in which both dispensary and intensive work have been conducted, the rate of hookworm infection found among all persons examined at the beginning of dispensary work prior to December 31, 1914, with that found among all persons examined in the same counties at the beginning of intensive work and subsequent to January 1, 1915.

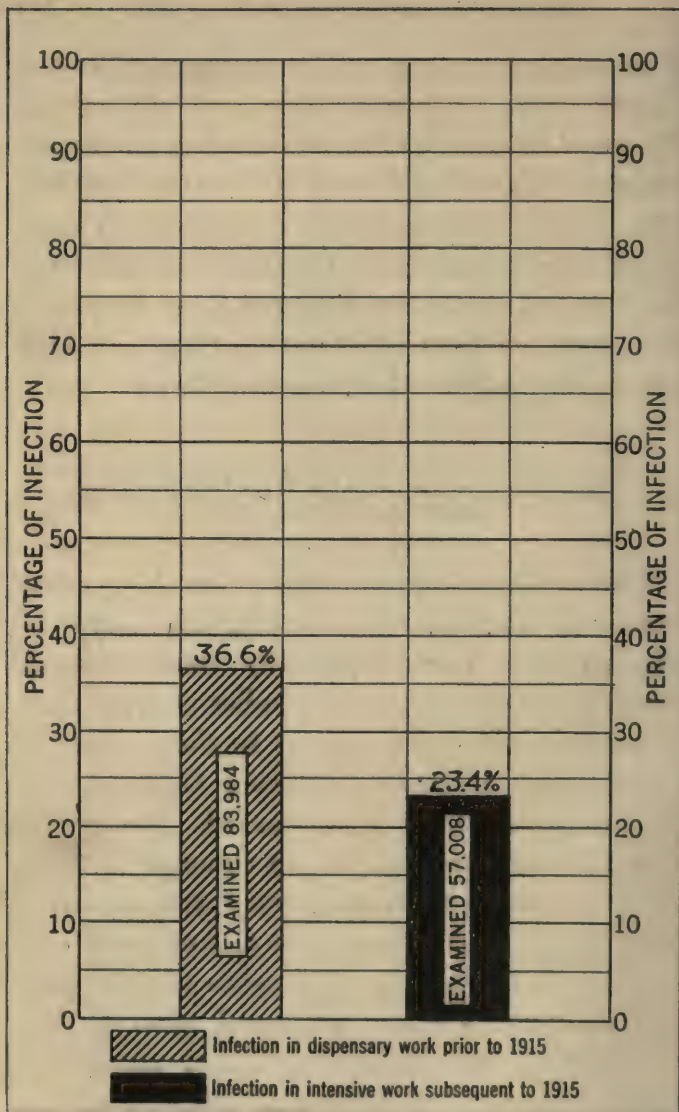


Fig. 17—Reduction of Hookworm Infection in 48 Counties of the Southern States

It is probable that in the dispensary work a larger proportion of infected than of non-infected persons responded to the invitation to be examined. Nevertheless, these figures indicate that for all the counties in which both types of work have been conducted, the average infection has been reduced from the rate of 37 per cent., established by the examination of 83,984 persons in the earlier dispensary work, to the rate of 23 per cent., found by the examination of 57,008 persons in the later intensive work. This exhibit suggests that of every three persons who formerly had the disease, one is no longer infected.

TREATMENT FOR HOOKWORM DISEASE AS A MEANS OF REDUCING GENERAL SICKNESS CALLS

Figures showing a remarkable reduction in sickness calls, for all diseases, following treatment of estate laborers for hookworm disease, are furnished by the superintendent of seven estates in Ceylon. On these seven estates the work of treatment was carried out during the early months of 1917, although in certain instances it was not completed until November and December. This has prevented a complete record being obtained of the full benefits resulting from treatment.

These figures show a decrease of 1,132 calls,

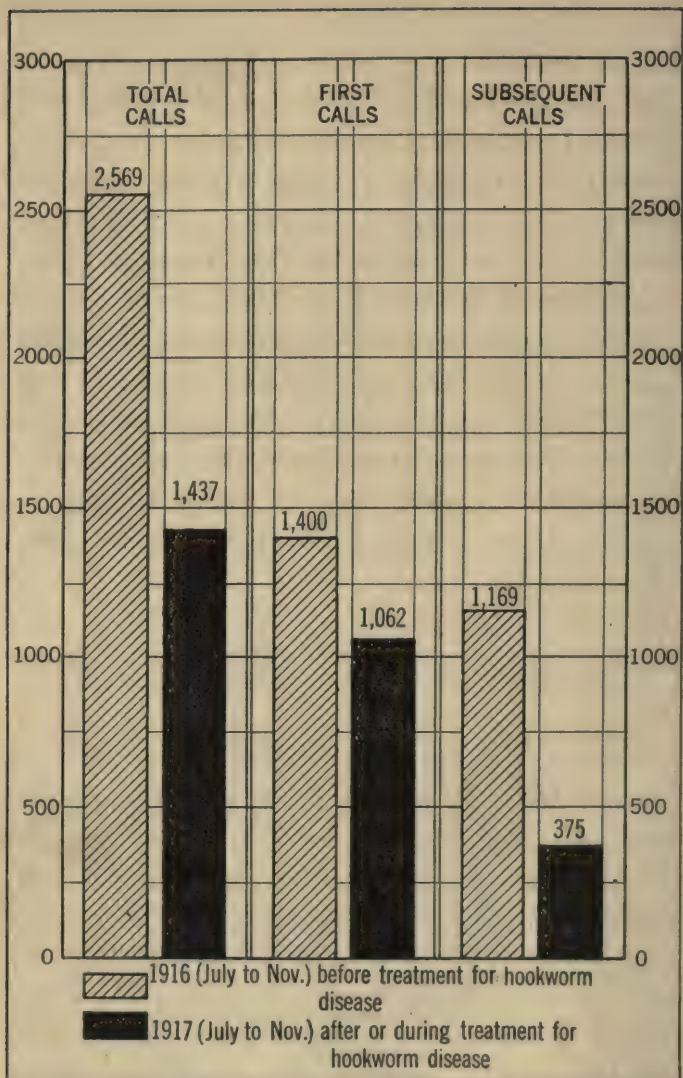


Fig. 18—Reduction in Sickness Calls from All Diseases. Seven Estates Treated for Hookworm Disease. Ceylon

or 44 per cent., during the months of July, August, September, October, and November, 1917, as compared with the same months of 1916. The largest reduction, 68 per cent., occurred in the calls for second and third treatments. This would seem to indicate that the improvement in health effected by treatment for hookworm disease resulted in the patients being more readily cured of this and other diseases. (See Fig. 18, page 130.) There was a marked decrease in bowel complaints and in malarial fevers among the coolies on these estates.

V

SOIL SANITATION AS A MEANS OF CONTROL

It has been suggested in the previous chapter that hookworm disease may be controlled by the treatment and cure of infected persons; but curing individuals of hookworm infection is of comparatively little value unless at the same time steps are taken to prevent reinfection. Since every embryo in the soil was hatched from an egg which came from the intestine of an infected person, it follows that if all carriers were cured, and kept cured, the soil would tend to become sterile and the parasite would become extinct. It is also true that, inasmuch as the disease is spread through the deposit of feces in places where the eggs can thrive and the larvae get into the body, its permanent prevention is above all else a matter of soil sanitation. And soil sanitation is here used to indicate the prevention of soil pollution by the voiding of excrement and urine into proper latrines, instead of indiscriminately upon the ground. If that is done the larvae cannot reach the human host.

PROBLEM OF SEWAGE DISPOSAL

The seriousness of the problem of sewage disposal is indicated by the following figures. A survey was made (in 1912-15) in 770 counties in 11 states of the United States with a view to ascertaining the conditions responsible for the prevalence of hookworm infection. At only six-tenths of one per cent. of the 287,606 farm houses examined were the provisions for the prevention of soil contamination reported by the state authorities as being satisfactory. At 142,230 of the homes there were no latrines of any kind.

Efforts to induce the people to provide and to use some form of latrine that will prevent contamination of the soil have met with a considerable degree of success. But this very success has created a new problem which cannot well be ignored. Simply stated, the problem is this: How shall we find a satisfactory method for the disposal of sewage at the farm home,—one which the people in rural communities can be brought to adopt and to carry out, and one which will prove to be safe in actual experience under the conditions which prevail in these communities? It is believed that out of the growing volume and variety of experience which is being gained there will finally emerge some

form of adjustment that will prove satisfactory. Enough has already been done to afford a satisfactory basis for a critical study of the relative efficiency of the various methods employed.

This work of experimentation will need to be extended over a considerable period of time, and should cover a considerable area of field work, in order to test experience under a variety of conditions. As the work progresses from year to year it becomes increasingly apparent that the control of soil pollution in rural districts, both in this country and in foreign countries, would have a far-reaching effect in lowering death rates and in furthering public health. There is little doubt that typhoid, dysentery, diarrhoeal diseases—especially those of infants in summer time—and similar enteric infections, are to a very considerable extent due to the widespread custom of polluting the soil.

The Rockefeller Institute for Medical Research began, in January, 1916, a series of investigations (in a number of communities in the Southern States) to ascertain the relative efficiency of various types of latrines in soil formations of different kinds. The United States Hygienic Laboratory, the London School of Tropical Medicine, the Indian Research Fund Association, and the College of Agriculture and Forestry at Nanking, China, have especially

interested themselves in the particular problem of making feces available as a fertilizer by making it biologically safe. Extensive field and laboratory investigations along these lines have recently been made by the United States Hygienic Laboratory. The investigations of the London School of Tropical Medicine have established the fact that a substance known as "nitroline" does make the feces safe. It has not yet, however, been determined what effect this substance has upon their fertilizing value.

SOIL SANITATION IN MANY COUNTRIES

The demand for commercial appliances for the safe disposal of excrement evidenced by the remarkable increase in the number of firms engaged in their manufacture, is one index of the public interest in soil sanitation. These devices range from simple sanitary cans without seats, selling for less than five dollars, to elaborate septic tanks made of cement, with seats for several persons, and selling for \$100 or more. The Board has been in correspondence with 24 manufacturing concerns that sell toilets to the rural population of the Southern States, excluding those companies selling attachments which can be used only in towns and cities having sewerage systems. Of the 24, none has been in business

longer than five years and practically all have been organized since 1915. Three sell simple cans and pails without seats, six market chemical toilets, and five (principally large cement manufacturing concerns) install septic tanks. The reports received indicate that since these companies entered this field they have sold in this part of the country more than 7,000 sanitary cans, about 3,500 chemical toilets, and nearly 19,000 septic tanks, or a total of about 30,000 sanitary appliances of these three main types, representing a value of approximately \$700,000. This is, relatively speaking, a large sum of money, for it must be remembered that it represents only a part of the voluntary expense assumed by the people of the South, over a short period of time, in the effort to protect themselves from the dangers of soil-pollution diseases.

Kiln Community, Hancock County, Mississippi, furnishes an excellent example of such sanitary reform. When intensive work was begun in this community, the preliminary survey showed that of a total of 305 homes only four had latrine accommodations that could be classed as satisfactory to the State Board of Health. These four had sewerage facilities. The widespread pollution of the soil was, undoubtedly, a contributing cause of the average

daily absence of 20 per cent. of the enrolled school children, and was responsible for the periodic recurrence of dysentery and typhoid epidemics. This conclusion is confirmed by the record of diseases. At the time of the first survey there were 407 cases of hookworm infection among the 1,002 residents who were microscopically examined—a percentage of 41. In addition, during recent years, there have been 12 cases of tuberculosis, 47 of typhoid fever, 184 of malaria, and 384 of dysentery. In all, 238 of the 305 families have had one or more cases of diseases which are due to pollution of the soil.

The efforts of the staff to secure latrine accommodations at each home were successful in every instance but two. Modern, fly-proof latrines were built at 299 homes and 56 additional latrines, of the same sort, were erected at the churches, at the school, at public gathering-places, and at homes where more than one latrine was necessary. The maps on page 138 exhibit the improvement accomplished during the year.

In the summer of 1916 there were 47 cases of dysentery in the logging communities; in the summer of 1917 only one adult and seven children were sick with dysentery. In the interval, in addition to the installation of latrines, homes had been screened, water had been piped to

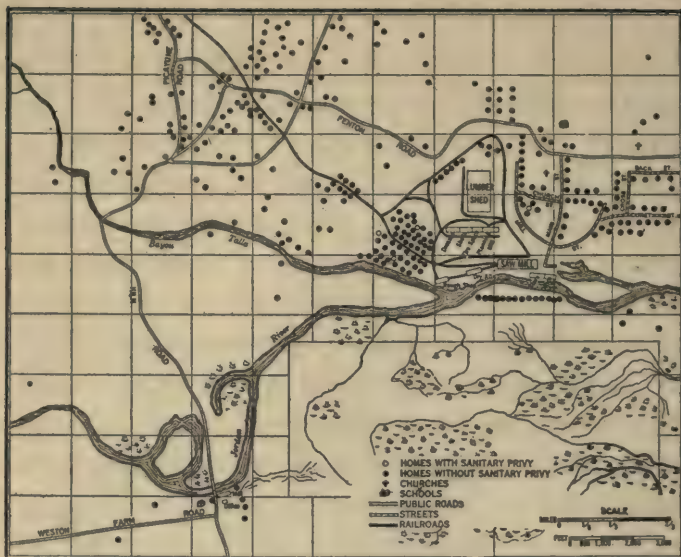


Fig. 19—Sanitary Survey of Kiln Community, Hancock County, Mississippi. Before Intensive Work

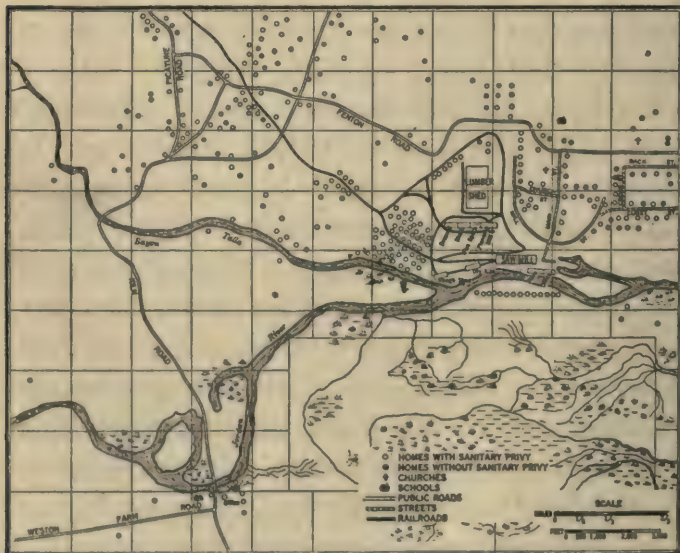


Fig. 20—Sanitary Survey of Kiln Community, Hancock County, Mississippi. After Intensive Work

each house from a newly bored artesian well, garbage cans had been introduced, and the community cleaned up generally. Only one case of typhoid developed in the community during 1917. At the close of the work there were but two danger spots from which soil-pollution diseases were likely to spread. (See Fig. 20, page 138, shaded circles.) During 1917, work similar to that conducted in the Kiln Community, though not in all cases equally thorough, was done in 99 other communities in the Southern States.

In Virginia, the records of the State Department of Health show that the morbidity from typhoid fever has been reduced from 14,400 cases in 1909 to 5,038 in 1917—a reduction of 65 per cent. Taking the reduction year by year, this represents a total saving in cases of typhoid estimated at between 40,000 and 50,000. The State Commissioner of Health, and others familiar with the conditions, attribute much of this striking decrease to the work that has been done in the prevention of soil pollution. There has, probably, been a similar reduction in morbidity from transmissible diseases in other Southern States where systematic health work has been conducted.

In British Guiana, during 1917, the Government, through its corps of sanitary inspectors, supervised the erection of 1,911 new latrines and the repairing of 2,658 old ones. These inspectors, who are required to pass rigid examinations based on a course of instruction in sanitation, are paid by the villages in which they work, but are under the authority of the Local Government Board, a central executive body of the Colonial Government. This plan of control removes the possibility of interference by the village authorities, some of whom are natives quite ignorant of sanitation. The inspectors are located in districts of about 5,000 inhabitants. They usually remain permanently in one district, and it is their duty to see that good conditions are not merely established but maintained. Each year, as the finances of Government permit, additional sanitary inspectors are appointed for other districts, thus gradually extending the territory covered.

Sanitary inspectors have authority not only to compel the building and use of latrines, but also to require the people to cut down underbrush in interlot drains, correct faults in drainage systems and thus prevent mosquito breeding in accumulations of stagnant water, screen all vats in which water for drinking and culinary purposes is stored, and make whatever other

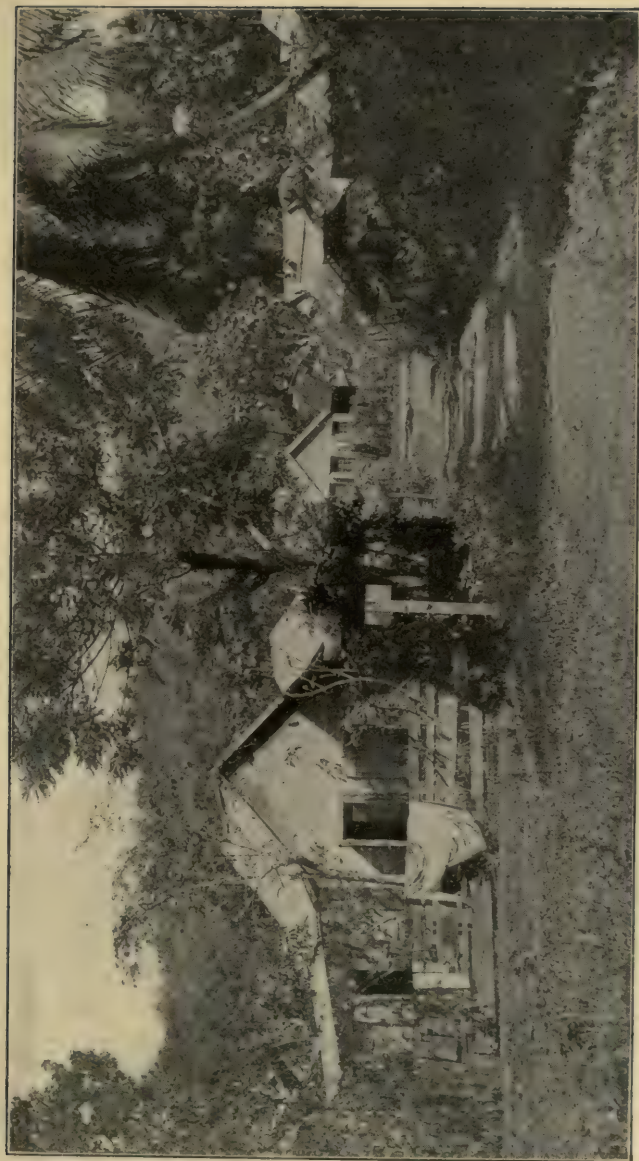


Fig. 21—Typical West Indian Village. Houses Close Together. No Provision for Disposal of Excreta. St. Lucia



Fig. 22—Pit Latrine. Concrete Superstructure. To be Made Fly-Proof. Coffee Plantation. Guatemala

improvements in sanitation are deemed necessary in order to ensure the health of the community. It is usually possible to secure these changes by means of education and persuasion; but when these means prove ineffective, legal notice is served that the particular reform must be completed within a specified time. Failure to comply within that time is punishable by fine or imprisonment.

In Dutch Guiana, shortly after the Colonial Ankylostomiasis Commission began its work for the relief and control of hookworm disease, the Government issued police regulations which defined all estates, plantations, and plots of ground as public lands, and then declared pollution of the soil thereon, or failure to keep the ground clean and clear of undergrowth, to be a nuisance punishable by fine or imprisonment. Longer terms of imprisonment and heavier fines are stipulated for defiling any water supply, water course, or reservoir of water customarily used for drinking or washing purposes.

In the course of the past year an act known as the Ankylostome Regulation, designed to support and further the work against hookworm disease, was drawn up. This act makes compulsory the construction of latrines of approved type at all habitable houses and at all public

buildings such as schools and churches. Landlords and proprietors (not tenants) are held responsible for the installation of latrines on their property, and provision is made for the appointment of one or more inspectors to see that the regulations are enforced. This act, which has been approved by the Netherlands Government, and which is to be made fully effective against hookworm disease through special decrees of the Colonial Governor, will greatly aid in bringing the disease under eventual control.

In Nicaragua, during 1917, the National Congress enacted a law providing for house to house inspection, once a month, for the purpose of observing sanitary conditions. Local authorities are vested with the power to compel the remedying of deficiencies in old latrines or, where necessary, the construction of new latrines which conform to models approved by the Superior Board of Health. If a laboratory of the Department of Uncinariasis is operating in a town, the law provides that visits be made in company with the technical assistants connected with the laboratory, who thus become invested with the character of sanitary inspectors. The Governor of each department is charged with the enforcement of the decree.

In Guatemala, a presidential decree was issued during the year which makes obligatory the installation and proper maintenance of latrines. As a result many villages and plantations have introduced such sanitary measures as removing rain barrels and tin cans containing stagnant water, filling in or draining backyards and swampy areas, making filth and rubbish inaccessible to fowls and animals, and either correcting defects in old latrines or constructing new ones. The crowding of thousands of people in the public parks, without toilet conveniences, following the earthquake of December 25, not only offered unlimited opportunities for the spread of disease but at the same time brought to the attention of Government and people as never before the pressing importance of latrines.

SANITATION OF THE SOIL IN ADVANCE OF TREATMENT IN CEYLON

More and more it is becoming possible to limit the curative work against hookworm disease to areas in which measures for the prevention of soil pollution have been carried out in advance. The reason for this is the increase in laws requiring the construction of latrines. It is strikingly true in Ceylon, where a widespread movement for the prevention of soil

pollution is under way. In November, 1916, regulations requiring the installation of sufficient latrines on all estates within the period of one year were enacted. Thus, on the three areas in which work was inaugurated during the past year (Dickoya, Bogawantalawa, and Norwood), sufficient latrine accommodations had been provided and were in use before the work of examination and treatment began; while in the Matale area, where the work had been in progress since January, 1916, all but two of the 24 estates had been so provided. It was in the Matale area, during 1916, that on one estate the reexamination of coolies who had been cured of hookworm disease showed such a high rate of reinfection as to convince both the Government authorities and the planters of the necessity for carrying out thorough-going measures for the safe disposal of excreta. This experience led to the passage of laws for the control of soil pollution. In Kalutara district, located in the Western Province, the villages are being sanitized and remodeled, and on a recent visit it was found that more than 20,000 latrines had been installed during the year.

VI

HOOKWORM DISEASE IN MINES

An investigation of the literature of the subject of hookworm disease in mines was made by the Board during the year. The following paragraphs suggest the conditions existing in a number of European countries.

INFECTION IN EUROPEAN COUNTRIES

In Italy, the disease has probably prevailed for centuries. In 1908 an infection rate of 38.2 per cent. was found among 429 miners in two mines. In 1913 an infection rate of 57 per cent. was found among 23,063 workers in the sulphur mines of Sicily.

In France, investigations were begun by the Government in 1904 which covered 82 per cent. of the 144,133 underground miners. The average percentage of infection was found to be 4.6 per cent. It will be recognized that this comparatively low percentage is for a very large proportion of the total population of the country, and not for a single selected area. Legislation has been enacted which requires mine owners to meet hospital expenses for treatment,

In England, the problem is limited to tin mines, of which there are about 50. In the course of a limited investigation 127¹ men were examined; these disclosed an infection rate of 66 per cent.

In Belgium, the intensity of infection ranged from five per cent. to 92 per cent. Out of a total of 27,153 underground miners in the Liege district, 3,590 were examined and of this number 818, or 22.79 per cent., were found infected. Of the 72 pits in the district, 49 were infected.

In the Netherlands, a survey of six mines made in 1904 showed 373 cases, or 25.05 per cent., among 1,489 miners. The degree of infection ranged from 15 per cent. to 67 per cent. Between the years 1904 and 1914, 36,047 applicants for work in mines were examined and of this number 755 were found to be carriers.

In Germany, 32,576, or 16.8 per cent., were found infected out of a total working force of 194,127. The average rate of infection among 12,600 men in six of the worse mines was 54.1 per cent.; in one mine it was 84 per cent. Of the 234 mines subjected to examination, 113 showed evidence of the presence of the disease.

¹ Unless otherwise stated the figures quoted are for the year 1903.

In Hungary, only a small percentage of the total mining population has been investigated. Of the 61,092 underground miners employed, 8,400 were examined, and the percentage of infection was found to be from 85 to 100.

In Austria, the conditions are unfavorable to the spread of the disease. Up to September, 1906, only 44 cases had been discovered, based on the examination of 7,517 miners working in 519 mines. These 44 were located in 19 different mines.

In Spain, the disease is probably more acute than in any other European country. The infection ranges from 50 per cent. to 95 per cent., and is heaviest in the lead mines of Linares.

INFECTION IN THE UNITED STATES

It is not Europe alone, however, that is interested in the problem of hookworm disease in mines. The whole world is concerned, for, without a passport or by-your-leave, the infection crosses all frontiers. It is, for example, being carried from Europe to the mines of the United States. A survey of the mines of California in 1916 revealed widespread hookworm infection and led to the first systematic

campaign for the control of the disease in mines ever undertaken in this country. Although up to the present time no general survey has been made to determine the precise extent and distribution of the infection, a number of cases of infected miners have been found in the mines of Nevada, North Carolina, Kentucky, Tennessee, and West Virginia. In all probability careful investigations would disclose the presence of cases in the mines of other states.

CENTERS OF INFECTION

In practically every country where the disease has secured a firm footing, some one mine, in which the prevailing conditions are particularly favorable, has usually become the center of extraordinarily heavy infection and has served as a relay station from which the disease has been passed forward into new areas. For instance, the seat of infection in Sicily was the mines of San Giovannello and San Giovannello Lo Bue in Lercara, where the degree of infection was 100 per cent. and 96 per cent., respectively; in Hungary it was the Brennberg mine, with an infection of 100 per cent.; in Germany the Graf Schwerin, infection 96 per cent.; in England the Dolcoath mine, infection 94 per cent.; in Belgium the Corbeau aux Berleur, infection 92 per cent.;



Fig. 23—Group of Miners. All Infected with Hookworm Disease. China



Fig. 24—Chinese Mine. Naked Bodies Offer Ready Access to Hookworms

in Spain the Linares mines, infection 75 per cent.; in France the Beraudiere mine (St. Etienne basin), infection 73 per cent.; and in Holland the Neuprick, infection 67 per cent.

MEASURES OF CONTROL

The measures of control which have proved most effective are: (1) provision of underground latrines and stringent enforcement of their use; (2) location of infected miners by means of thorough microscopic examination of stools; (3) treatment of those found infected and dismissal of those who, after treatment, remain uncured; (4) refusal of employment to applicants unless, after careful microscopic examination, they are found to be free from infection; (5) periodical reexaminations of miners who are most likely to become exposed to reinfection, in order that new cases may be promptly located.

RESULTS OF CONTROL MEASURES

The employment of these several measures has resulted in a marked reduction in infection. Among the 194,127 miners examined in Germany in 1903, before the introduction of measures of control, 32,527 were found infected. In 1912, after these control measures had been in operation for nearly a decade, only 497 carriers were found among 277,627 miners examined; a reduc-

tion from 16.8 per cent. to .18 per cent. In the Netherlands, the reduction of infection during the decade from 1903 to 1913 was from 25 per cent. to .32 per cent. In the Liege district of Belgium, the reduction of infection was from 22.79 per cent. in 1902 to 1.2 per cent. in 1913. Germany, Holland, Belgium, and England are the only countries which have made any considerable effort to control hookworm infection in mines.

PRELIMINARY WORK IN CHINA

Realizing the importance of this phase of the work of hookworm control, the International Health Board has undertaken a demonstration in the control of the disease in the Pinghsiang Colliery, in the Kiangsi Province of China. The Board is working in cooperation with Government and mining interests. In this mine, the largest in the country, probably about 11,916 miners are employed; 7,345, or 62 per cent., of whom are underground workers. The preliminary survey indicated a rate of infection of 85 per cent. among these underground workers. The rate among workers on the surface was found to be 32 per cent. (See Fig. 25, page 155.)

There are many opportunities for acquiring the infection. Not only are the miners' feet bare, but their bodies are often naked, and in the low

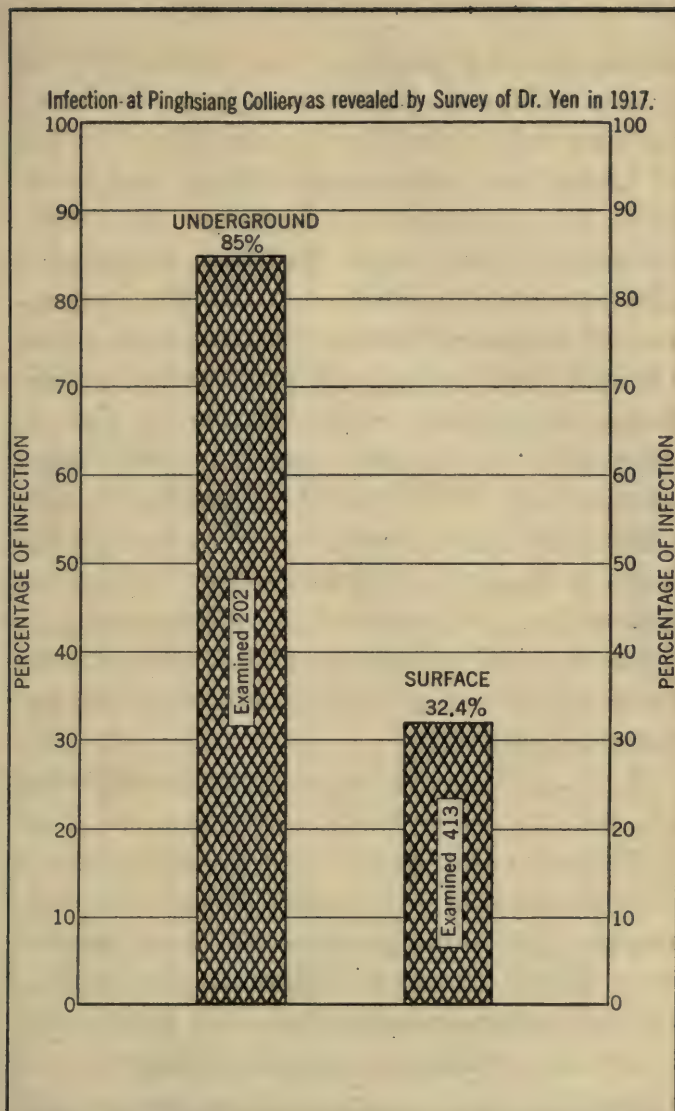


Fig. 25—Hookworm Infection at Pinghsiang Colliery. China

places it is not uncommon for their entire uncovered bodies to come into contact with highly infected mud. (See Fig. 24, page 152.) The lack of latrine accommodations underground means that the excrement is deposited everywhere throughout the mines. The high temperature and extreme humidity make for the propagation of hookworm larvae. Water trickling from the roofs and through the walls of the galleries keeps the interior moist. Sitting on the wet ground but once is said to result in symptoms of ground itch. Still other opportunities for acquiring the infection are afforded by the fact that water in the drains is often used for drinking and for washing. However, the custom among the Chinese of boiling their water and making it into tea before drinking it, reduces somewhat the danger of infection.

In carrying out measures of relief and control, the Board is undertaking to conduct the initial examination and treatment of the miners and to offer suggestions as to needed sanitary improvements. The mining authorities have contributed 20,000 Mexican dollars to the work of control and are cooperating in the introduction of necessary sanitary measures. There is every probability that a permanent sanitary department will be established after the Board has withdrawn its staff.

VII

LOCAL SUPPORT OF THE WORK

During the past four years, the Board has co-operated in the control of hookworm disease in a dozen states of the Union and in more than a score of foreign countries. Probably the outstanding, and certainly the most gratifying, feature of the work during the past year has been the degree of financial responsibility assumed by these several communities and countries. Year by year, as the work has progressed, an increasingly large proportion of the total expense involved has been borne by the Government, thus gradually preparing the way for the ultimate withdrawal of the Board. A few illustrations of this increasing measure of local support are here cited.

THE WORK IN BRAZIL

Brazil furnishes an excellent example. Less than two years ago, on invitation by the Government of the State of Rio de Janeiro, the Board sent a representative to begin operations in that country, in cooperation with Government. First, an infection survey was made of the entire State of Rio de Janeiro. This survey, which was

finished in the month of March, showed the geographical distribution and degree of infection, and the sanitary conditions which were responsible for its presence and spread. The finding of an average infection of nearly 90 per cent. among the inhabitants of the unsewered localities and country districts of the State, and of approximately 80 per cent. among the entire population of the State, provoked serious interest in the problem. The survey was followed by a demonstration, in a selected area, of work for the relief and control of the disease.

When this first unit began operations on May 1, 1917, the occasion was marked by appropriate ceremonies in Rio Bonita. Cordial felicitations were received from the National Academy of Medicine, from the President of the Oswaldo Cruz Institute, and from the President of the State. The previous day, April 30, the President had signed a decree which established a Service for the prevention of hookworm disease as a part of the Department of Hygiene and Public Health. The Board's Director in Brazil was appointed Chief of that Service. The Legislative Assembly, by unanimous vote, has enacted a sanitary ordinance requiring the installation of latrines and has begun the organization of a permanent sanitary staff. Funds for this first demonstration were supplied by the Board. Before the demon-



Fig. 26—Nurse Making House to House Calls. Fisherman's Family Receiving Treatment. Intensive Work Against Hookworm Disease. Ilha do Governador, Brazil



Fig. 27—Severe Case of Hookworm Disease Taking Medicine under Direct Observation of Nurse. Brazil

stration had been completed, work in another area was requested on the basis that the funds be supplied one-fourth by the state, one-fourth by the local government, one-fourth by the estate owners (sugar planters), and one-fourth by the Board. This proposition was accepted.

The Federal authorities, having already ascertained the prevalence of infection in the Federal District, asked that a demonstration be undertaken in a selected area within the District, and proposed to supply in funds and personnel one-half the cost. The area selected is the Ilha do Governador, an island in the Bay of Rio de Janeiro. It was selected because it is economically important, because its well-defined natural boundaries and its fixed population afford excellent opportunity for an effective demonstration to be made, and because its proximity to the national capital (45 minutes by ferry) makes it extremely easy for interested Federal and State officials to watch the progress of the work. Up to the close of the year, 3,762 persons had been examined, of whom 2,537, or 67.4 per cent., were found infected.

The Federal Health Service supplied a physician to assist the Director for Brazil in carrying out this demonstration, with a view to his becoming well-trained in the work. The Government is also furnishing a staff of 11 nurses, is

printing the necessary forms, and is providing a house for the laboratory, sleeping quarters for the staff, and free transportation for the material used in the work. The Board is called upon to provide only the medicines and the staff of three microscopists needed to examine specimens. Before the work in this area had been completed, Government provided funds for the simultaneous operation of five additional units under its own direction. The staff which is being organized and trained in the work is a part of the permanent Government sanitary organization designed for the control of hookworm disease and other diseases throughout the Federal District.

Following the demonstration in Rio de Janeiro, the State of Sao Paulo also invited cooperation in carrying out an infection survey and demonstration, Government offering to pay one-half of the expense from the beginning. Active operations were begun in the month of November in the town of Iguape, the county seat of a municipio situated on the sea coast, in which conditions are very favorable for the spread of hookworm disease. Up to the end of the year, 400 persons had been examined, of which number 394, or 98.5 per cent., were found infected. Towards the close of the year, the Director of the Public Health Service arranged with the Board to organize another unit for this State, agreeing

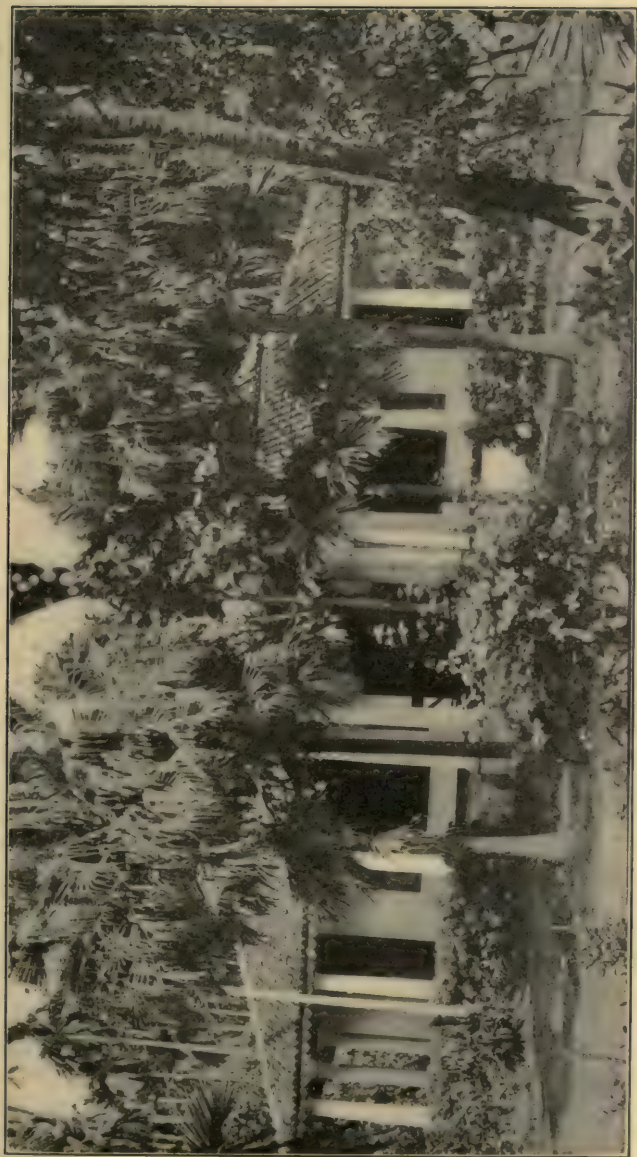


Fig. 28—Headquarters for Work Against Hookworm Disease. Matale, Ceylon

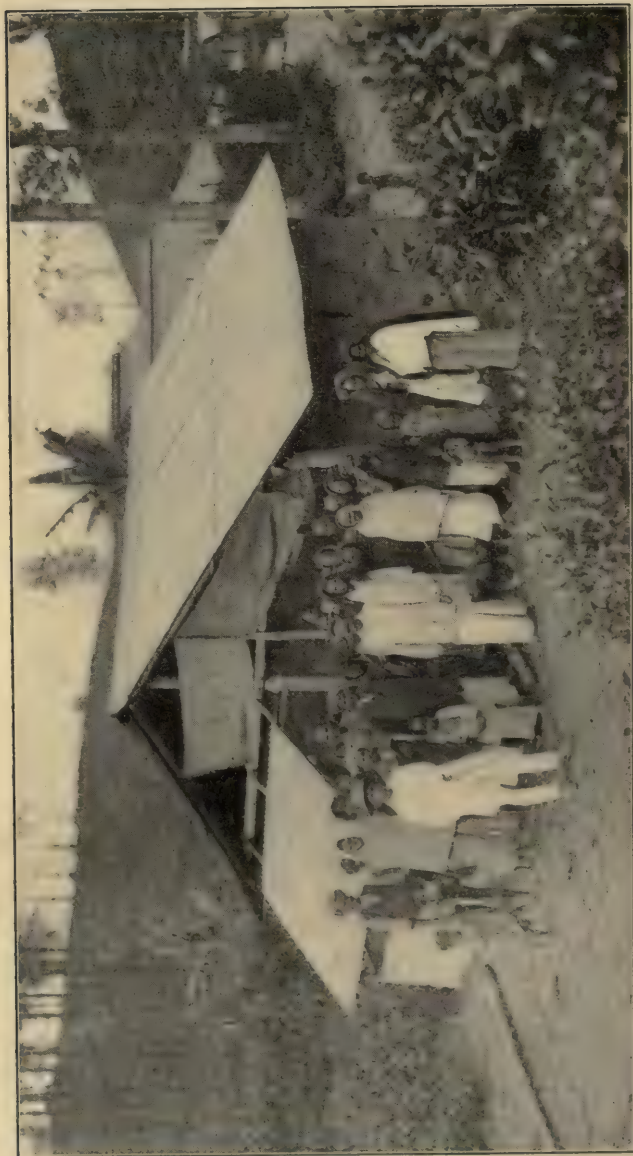


Fig. 29—Group of Hookworm Patients Gathered for Treatment at Assembly Ground. Ceylon

to pay two-thirds of the necessary expenses. In addition to this, the State has undertaken to build up a permanent sanitary organization and to sanitize all areas in advance of examination and treatment. Figure 30, page 166, indicates graphically the increased proportion of the expense being borne by local agencies in the State of Sao Paulo (Brazil), in Ceylon, and in North Carolina,

COOPERATION IN CEYLON

One-half the necessary funds for carrying on the work in Ceylon are supplied by the Government. It has, moreover, undertaken the task of organizing, training, and maintaining a permanent sanitary staff charged with the duty of providing measures against soil pollution, in all areas, in advance of the examination and treatment of the people. It is providing also for the training of medical officers, who will be prepared to carry the work forward after the Board withdraws. The people are instructed as to the seriousness of hookworm disease and as to the gains to be derived from primary sanitation. Villages in which lectures, or lantern demonstrations, on hookworm disease are held often elect a health committee at the close of the meeting and entrust this committee with the task of persuading the people to provide themselves with latrines

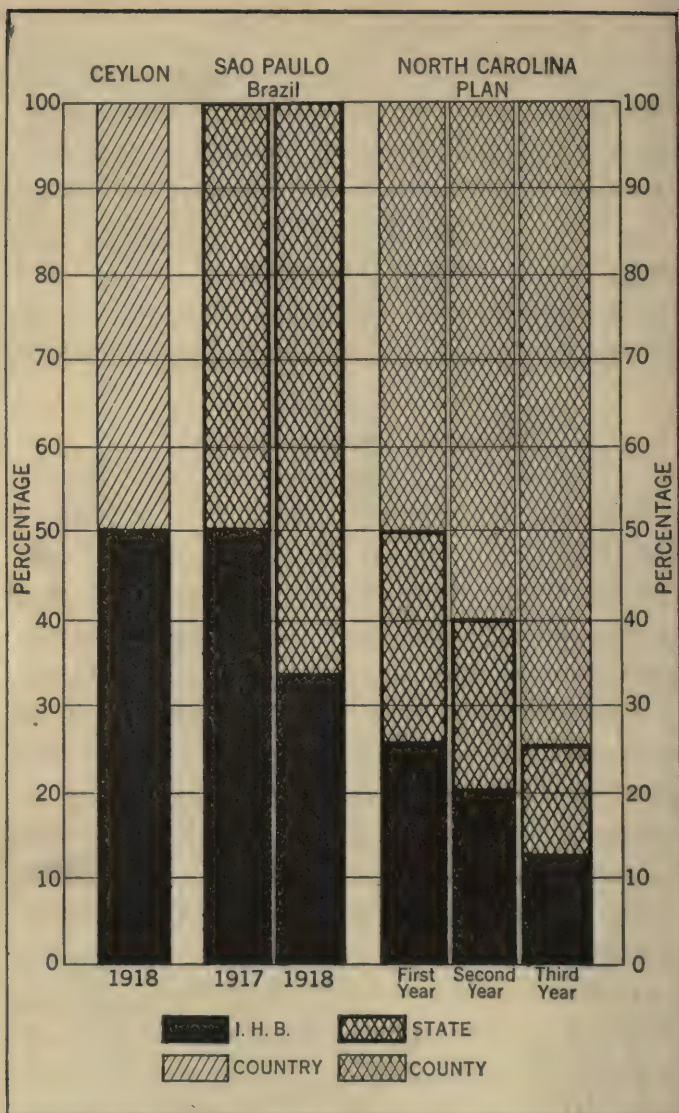


Fig. 30—Proportion of Expense for Work Against Hookworm Disease Being Borne by Ceylon, State of Sao Paulo (Brazil) and North Carolina, and Proportion Borne by International Health Board

and, in other ways, to improve health conditions. For example, in the district of Panadura, one of the influential Singhalese has joined the local committee and is assisting in the work among the poor: among other things he is planning to open a dispensary for the treatment of hookworm disease. Such results as these are particularly gratifying when it is remembered that the villages of Ceylon, with their mixed population, class distinctions, and religious prejudices, have long constituted one of the most perplexing problems in connection with the work.

The realization by estate owners of the benefits to be derived from the treatment of their laborers, has facilitated the work of control on these estates. Planters agree in advance to give active support to the undertakings. They provide, at reasonable cost, an adequate place as quarters, with an office for the director, accommodations for the laboratory and office staff, and board and lodging on each estate for one or two dispensers. They also assist in taking the census and in assembling the laboring force for treatment on specified days. In nearly all cases the planters also provide help for the dispensers, an assembly ground protected from rain and sun where the laborers can be kept during treatment, and an allowance of rice to be used in preparing "konje" for distribution before and after treatment.

SUPPORT IN SOUTHERN STATES

When the work was originally begun in the South, under the direction of the Rockefeller Sanitary Commission, the total expense was borne by the Commission. As the work has progressed, the states, counties, and local communities have assumed an increasing share of the necessary cost. This change is indicated by the fact that 20 counties have each appropriated a total of from \$3,000 to \$4,000, and 32 counties from ten to 25 cents per capita, for one year's work against soil-pollution diseases. It is even more clearly indicated by the fact that, for the work outlined for the Southern States during 1918, the states and counties are to pay at least two-thirds of the total expense and the Board not more than one-third. Under the three-year program outlined for North Carolina, the Board is to provide not more than 25 per cent. of the necessary funds for the first year's work, 20 per cent. for the second year's work, and twelve and one-half per cent. for the third year's work.

INCREASE IN STATE HEALTH FUNDS

There is no better barometer of the interest in public health work than appropriations. That public opinion, in the Southern States, is today

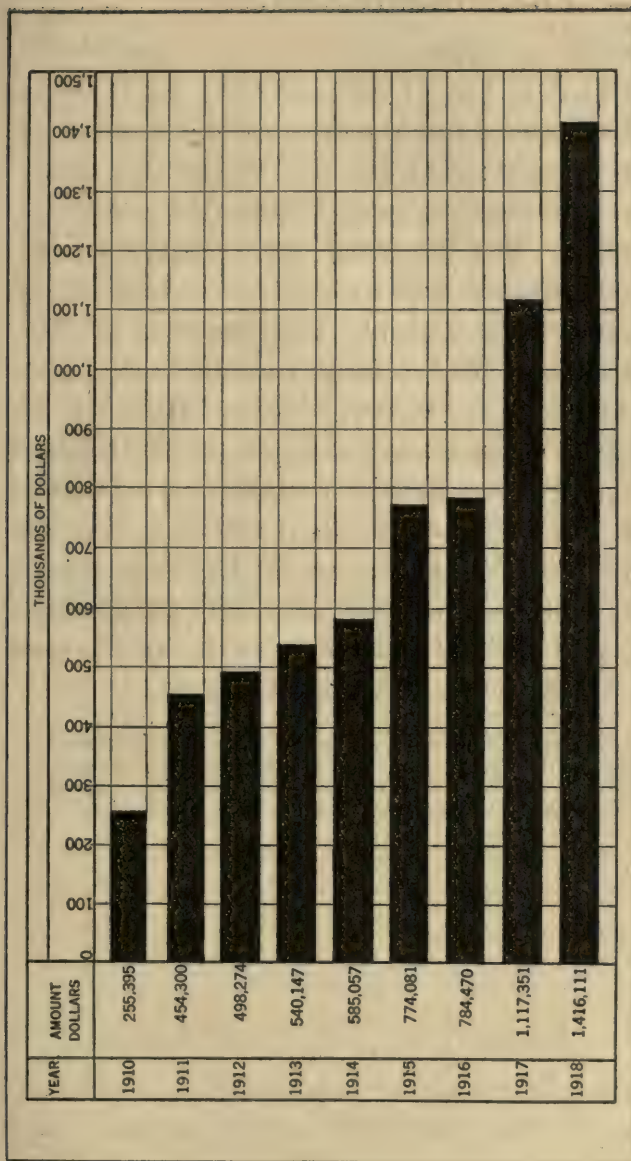


Fig. 31—Increase in Appropriations to State Boards of Health in Southern States, 1910 to 1918.
Funds for Antituberculosis Work Included

favorable to public health work is graphically illustrated in Fig. 31 on page 169,¹ which shows the increase in funds placed at the disposal of health departments by the legislatures of 11 states² during the period from 1910 to 1918, inclusive. The increased appropriations have enabled health departments to enlarge their personnel and multiply their activities. The amount available for health work in North Carolina in 1910 was \$18,200, while in 1918 it will be \$144,000. The amount available in South Carolina in 1910 was \$31,000 as against \$102,000 in 1918. Reference to the chart will show that the total resources available for the health boards of these 11 States in 1910 were only \$255,395 as compared with \$1,416,111 in 1918—an increase of 454 per cent. in less than ten years.

¹ The percentage of expense borne by the International Health Board, as indicated by the graph, does not include administration expenses.

² Alabama, Arkansas, Georgia, Kentucky, Louisiana, Mississippi, North Carolina, South Carolina, Tennessee, Texas, and Virginia.

PART TWO

OTHER ACTIVITIES OF THE BOARD

VIII

TUBERCULOSIS IN FRANCE

One of the unfortunate results of war conditions has been a marked increase in tuberculosis in a number of the belligerent countries. There are many indications that this has occurred, particularly in Belgium, Hungary, Italy, and France. Early in 1917 the Rockefeller Foundation, acting in response to a recommendation by its War Relief Commission and on assurance from the French Government that the undertaking would be welcomed, engaged Dr. Hermann M. Biggs, Commissioner of Health for the State of New York, to go to France and make a study of the situation in that country. On being advised by Dr. Biggs that the situation was menacing and that the French authorities, who were already taking steps to combat the disease, would welcome American aid, the Foundation, acting through the International Health Board, offered its cooperation to the French Government. On receiving assurances that assistance would be acceptable, the Board appointed a Commission for the Prevention of Tuberculosis in France with Dr. Livingston Farrand, President of the University of Colorado and formerly Secretary

of the American Association for the Study and Prevention of Tuberculosis, as its Director. The Commission arrived in Paris in July, made a survey of the field, established working relations with Government and existing agencies, and began active operations in September.

The policy of the Commission was clearly expressed by the Director when, in response to President Poincaré's warm words of welcome he said, "We are not here to give you instruction, but to fight with you against a common enemy." It is recognized that tuberculosis in France can be brought under control only by French agencies rooted in the life and traditions of the people and working over long periods of time. The Commission, therefore, while taking over a few American workers for temporary service, has sought from the beginning to work with existing agencies in organizing plans of operation and to enlist the services of French physicians and French visiting nurses in the work. These efforts are meeting with cordial response.

As part of a comprehensive plan of operation designed to cover the country, the Commission is centering its efforts on conducting a statistical survey with a view to defining the problem tentatively and laying the basis for a central registry for future guidance in the work; on establishing systems of tuberculosis dispensaries; on

training visiting nurses for service in these dispensaries; and on carrying out a campaign of popular education.

TUBERCULOSIS DISPENSARY SERVICE

The antituberculosis dispensary, with all its adjuncts, is the essential feature of an equipment for fighting tuberculosis and for this reason the Commission has made this the starting point in its work. After inspecting a number of admirable French dispensaries already in operation, and conferring with the authorities, it was agreed that in order to have the necessary freedom in testing the application of American methods to French conditions, the Commission should have a number of dispensaries under its own administration. To this end, it selected the 19th Arrondissement of Paris and the Department of Eure et Loire, as representing urban and provincial conditions, the purpose being to operate in each of these, as a demonstration center, a complete system of dispensaries with modern equipment and trained personnel. The work in these centers, while under American supervision, is being conducted in intimate association with local government and volunteer agencies. In the Department of Eure et Loire, for example, dispensaries are in operation at Chartres, Dreux,

Chateaudun, and arrangements have been made to open a fourth at Nogent-le-Rotrou, all under French auspices, but supplemented in equipment and personnel by the Commission.

- From these four centers it is planned, by supplementing local effort in similar manner, to reach out as rapidly as conditions permit into the surrounding rural districts. While developing these two centers—designed as testing laboratories in their earlier stages, and as demonstrations and training grounds when more fully developed—the Commission is making a detailed survey of France with a view to simultaneous cooperation with local authorities in other parts of the country. At the end of the year, cooperative relations had been definitely effected or planned in Blois, Tours, Augers, Le Mans, Saint Nazaire, Quimper, Chalons-sur-Marne, Troyes, Lyons, Saint Etienne, Macon, and Bordeaux.

This effort to aid France in establishing a system of antituberculosis dispensaries cannot be understood without taking into consideration the complete cooperation of the American Red Cross. The control of tuberculosis is inseparable from other aspects of public health work and is related with peculiar intimacy to child welfare. The Children's Bureau of the American Red Cross has undertaken a campaign for the

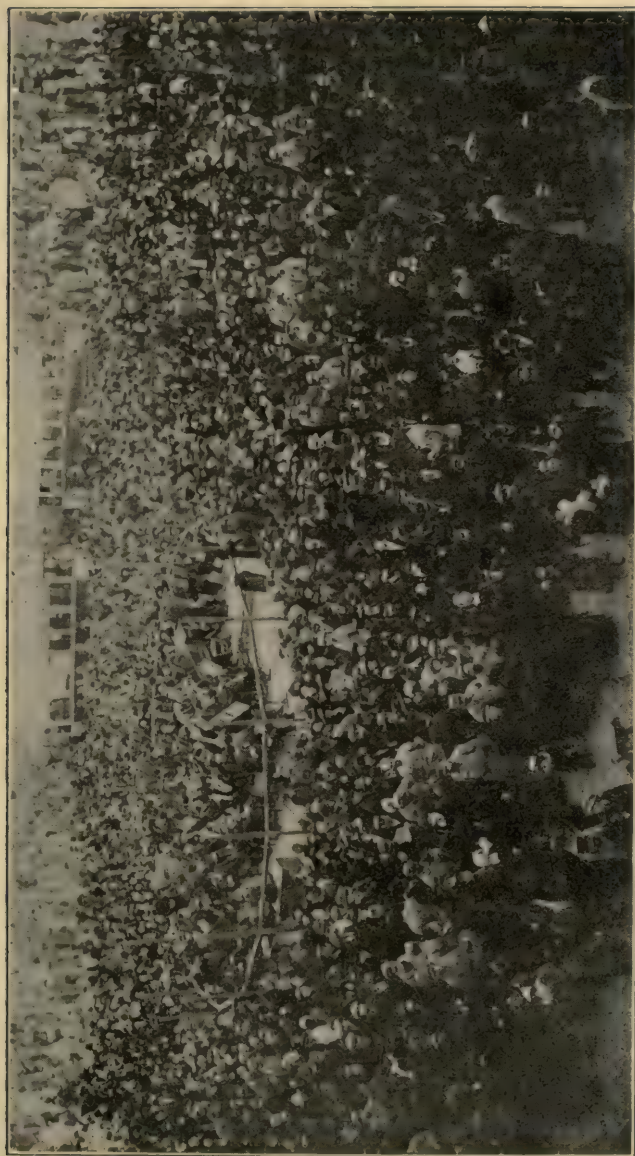


Fig. 32—Crowd Awaiting Arrival of American Tuberculosis Commission at Rennes. France



Fig. 33—Mobile Tuberculosis Exhibit. Used in Connection with Educational Campaign. France



Fig. 34—School Children Listening to Lecture on Tuberculosis. France

promotion of child hygiene and is conducting all its work in cooperation with the Commission for the Prevention of Tuberculosis; children's dispensaries and tuberculosis dispensaries are being housed in the same buildings and are supplementing each other in equipment, in personnel, and in work. The Red Cross is providing funds for the children's work, is supplementing the efforts of local relief agencies, and is aiding in establishing sanatoria to which the dispensaries may send patients needing such care.

VISITING NURSING

If the fight against tuberculosis centers in an efficient dispensary service, the dispensary centers in the work of the visiting nurse, or, to borrow the Commission's better phrase, the *visiteuse d'hygiène*. It is taken for granted that the dispensary will be equipped for diagnostic and medical care of patients, but it is mainly through its staff of *visiteuses d'hygiène* that it will reach the homes, discover the incipient cases, and in time effect such reform in individual hygiene and in family and community conditions of living as to limit or prevent the spread of the infection. It was clear that the opening of dispensaries would rapidly multiply the demand for trained French women, of the right type, to do this work.

To meet this situation, a working arrangement was entered into with the three leading centers for the training of visiting nurses in Paris, a standard course of training was agreed upon, stipends were provided for student-nurses of approved qualifications, and opportunity was provided in connection with the dispensary service in the 19th Arrondissement for practical experience under competent supervision in the daily rounds of the service. Also in connection with this dispensary service, graduates who have had the regular course for hospital nursing are being trained in the visiting and social service sides of the work. The Director of this division speaks with enthusiasm of the type of French women who are entering this service and of the way in which they are measuring up to its requirements. At the close of the year there were 60 undergraduate, and ten graduate nurses taking the course, with the demand for trained workers out-running the supply.

CAMPAIGN OF EDUCATION

An effective program for the prevention of disease must be fundamentally educational. The dispensaries, with their visiting nurses, are, as a matter of fact, educational agencies, each doing permanent and intensive work in its own com-



Fig. 35—Poster Used by Commission for Prevention of Tuberculosis in France

COMBATTEZ LA TUBERCULOSE

COMMENT ELLE SE PROPAGE



Tuberculose par projection



Tuberculose par contact direct



Tuberculose par contact indirect

LES ALLIÉS DE LA TUBERCULOSE



Tuberculose par projection



Tuberculose par contact direct



Tuberculose par contact indirect



Tuberculose par contact indirect

LES RAVAGES DE LA TUBERCULOSE
COMPARÉS A CEUX DES AUTRES
MALADIES

VOUS POUVEZ & DEVEZ
ÉVITER LA TUBERCULOSE

Tuberculose Poux de la tête Coqueluche Diphtérie Scarlatine

UN DEUX-AN HUIT, on dit de la tuberculose

La tuberculose est un grand ennemi
du combat et du service patriote

La tuberculose peut et doit être vaincue

Les lieux publics, les réunions, les
cité exposés à la tuberculose, c'est
à vaincre les tuberculeux

LES ENNEMIS DE LA TUBERCULOSE

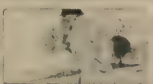


Tuberculose par contact indirect

PRÉCAUTIONS QU'UN TUBERCULEUX DOIT PRENDRE



Tuberculose par projection



Tuberculose par contact direct



Tuberculose par contact indirect



Tuberculose par contact indirect

COMBATTEZ LA TUBERCULOSE

Fig. 36—Poster Used in Campaign Against Tuberculosis. France

munity. This educational work of the dispensaries is, however, being supplemented by a campaign of popular instruction designed to cover the whole country and to educate the people *en masse*. Its central feature is the traveling exhibit mounted on motor trucks. Each car carries a motor-generator to produce the current for the moving pictures; a moving picture machine with films, slides, and screens; a complete exhibit of 42 panels, and a full supply of printed matter. Each carries a mechanic-driver and a demonstrator, and is preceded by a courier who makes the necessary local arrangements for demonstrations, lectures, and publicity.

By the end of the year the Commission had one traveling exhibit in operation, with a second car ready and two others in preparation; and had developed an extremely effective body of literature for schools, for the press, and for general distribution. The Children's Bureau of the American Red Cross is also represented in these traveling exhibits. The reception accorded these exhibits, by public officials and by the people, has been stirring in its patriotic fervor; the response to the spirit in which American cooperation is offered has been both generous and enthusiastic.

IX

MALARIA CONTROL

Malaria, like hookworm disease, is prevalent over a large portion of the globe. These two infections constitute what is probably the most serious obstacle to the development of civilization in the regions where they prevail. For the past few years the International Health Board has cooperated with Government in the carrying out of measures for the control of intestinal parasites in the infected states of our own country and in a number of foreign countries. Recently, with a view to stimulating more energetic measures against malaria, it has interested itself in the problem of malaria control. It has not attempted to put into operation a finished anti-malaria program, but rather to test working methods and to evaluate, separately, a number of control measures.

CONTROL BY STERILIZATION OF CARRIERS

Specifically, three control measures have each been given one trial at three different places and a fourth measure in two separate communities. In cooperation with the Mississippi State De-

partment of Health, and under the scientific direction of Dr. C. C. Bass of Tulane Medical School, an experiment was undertaken in 1916 to test the feasibility of controlling malaria in a community by sterilizing the human carriers. The experiment has been carried out in a rural delta community, in Bolivar County, Mississippi, where the extermination of mosquitoes under present conditions is not regarded as practicable. Something more than 25,000 people have been handled in the test. Similar work is being done on a smaller scale, in Sunflower County, as a check, while the results of the test in Bolivar County are being analyzed. In the meantime, no conclusions are attempted beyond the general indication, which seems apparent enough, that the malaria rate in a given community can be reduced by direct attack on the malaria plasmodia in the blood of the human host.

CONTROL BY SCREENING

The remaining tests were conducted in the State of Arkansas in cooperation with the United States Public Health Service and the Arkansas State Department of Health. In a rural community near Lake Village, effort was made to test the control of malaria by screening. Every occupied house in the community was screened

with galvanized wire cloth, 16 mesh, and the people were taught not only the importance of keeping the screens in good condition but also the danger of exposure to mosquitoes on the outside after dark. Each home was inspected at regular intervals throughout the season. No other measure was employed. A parasite index, taken in May, 1916, when the work began, showed an infection of 11.97 per cent.; a second parasite index, taken in December of the same year, showed an infection of 3.52 per cent., a reduction of 70.6 per cent. The third index, which it was designed to have taken in May, 1917, and which would have offered a more instructive comparison, was omitted for lack of time. In the autumn of the year, the screens in all the homes were found to be in good repair, and the people—mainly typical plantation negroes—were thoroughly convinced of their value. The average cost of screening in this community was \$14.59 per house. Estimating the life of the screen at two years, the average annual cost of screening would be \$7.29. The per capita cost on this basis was \$1.75.

CONTROL BY PROPHYLACTIC QUININE

In another rural community near Lake Village, prophylactic quinine was tried as the sole meas-



Fig. 37—Mosquito Breeding-Place. Crossett, Arkansas. Before Antimalaria Operations



Fig. 38—Street Ditch. Crossett, Arkansas. Dug to Prevent Mosquito Breeding



Fig. 39—Typical Breeding-Place of Mosquitoes. Crossett, Arkansas.
Before Ditching



Fig. 40—Same Place After Ditching

ure of control. Under the direct supervision of the physician in charge, it was administered to all persons in the community in doses of five grains, morning and evening, making ten grains a day for two successive days each week. For children under 15 years of age, the dosage was reckoned at one grain for each three years and administered in the same way. A parasite index, taken in May, 1916, when the work began, and again in December of the same year, showed a reduction of 64.45 per cent. Again one must regret the omission of the index for May, 1917. The per capita cost of the work, omitting the overhead, was 57 cents.

CONTROL BY ANTIMOSQUITO MEASURES

At Crossett, Arkansas, a lumber town of 2,029 inhabitants, an attempt has been made to test the feasibility of controlling malaria in a small community by resort to such antimosquito measures as would be within the limits of expenditure which such a community might well afford. The work was begun in April, 1916. Effort was directed toward the elimination or control of the breeding-places of mosquitoes, and that without major drainage. Borrow pits and shallow ponds were filled or drained; streams were cleared of undergrowth when this was nec-

essary to let the sunlight in; accumulations of *débris* were removed from the beds; and they were so regraded as to provide an unobstructed off-flow through a narrow channel. The one large pond which could not be drained was treated by removing vegetation and other obstructions from the edges so as to give the fish free access to all possible breeding-places. Artificial containers were removed or treated. All remaining breeding-places were sprayed once a week with road oil by means of either artificial drips or knapsack sprayers. No other measures were employed.

The results are graphically exhibited by Fig. 41, page 191. The reduction in malaria, as shown by a parasite index taken in May, 1916, and again in December of the same year, was 72.33 per cent. The reduction in physicians' calls for malaria (Company's records) in 1916, as compared with the number of calls for the previous year, was 70.36 per cent. Or, if the comparison be limited to the period June to December, when the work had become effective, the reduction in physicians' calls for malaria was 81.6 per cent.

At the end of the year the community took over the work and assumed its expense as well as its direction. The chart indicates the net result of community effort for 1917. The Company record shows that most of the malaria calls

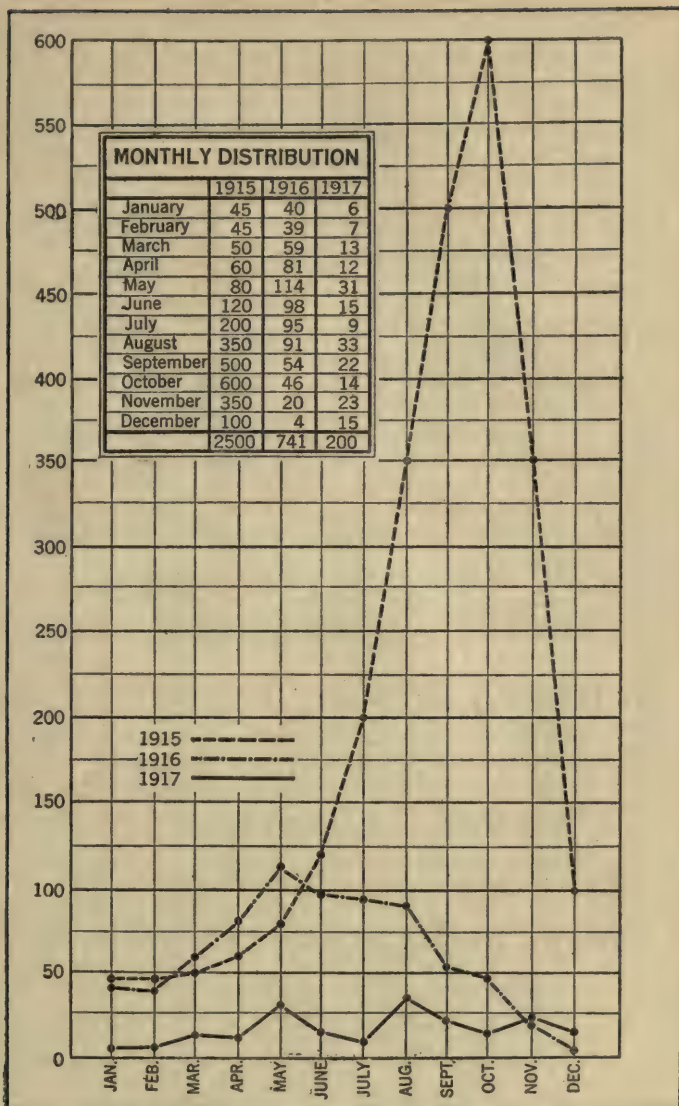


Fig. 41—Calls for Malaria, 1915 (estimated), 1916, and 1917, Crossett, Arkansas. Population, 2,029

for the year were among laborers newly recruited from the outside. With these importations there were only 200 physicians' calls for malaria in 1917 as compared with 2,500 calls for 1915, the year before the work began,—a reduction for the two-year period of approximately 92 per cent.

The per capita cost of the work for 1916, omitting overhead, was \$1.24; for 1917, still omitting the overhead, which has been negligible, it was \$.63. At \$2.00 per physician's call this community has been paying, annually, almost four times as much in doctors' bills alone for the privilege of having malaria as it has expended during the current year to be practically free from malaria and from the mosquito as a pest.

At Hamburg, Arkansas, the county seat of Ashley County, similar measures were undertaken after the work at Crossett was taken over by the community. A preliminary survey made at the height of the previous malaria season, had revealed a high malaria rate, with anopheles breeding profusely in ponds and streams throughout the municipal area. Figure 42, page 193, shows the large number and wide distribution of breeding-places. The measures which had been carried out at Crossett the previous year were repeated here and with similar results. A malaria index, taken in May and again at the end

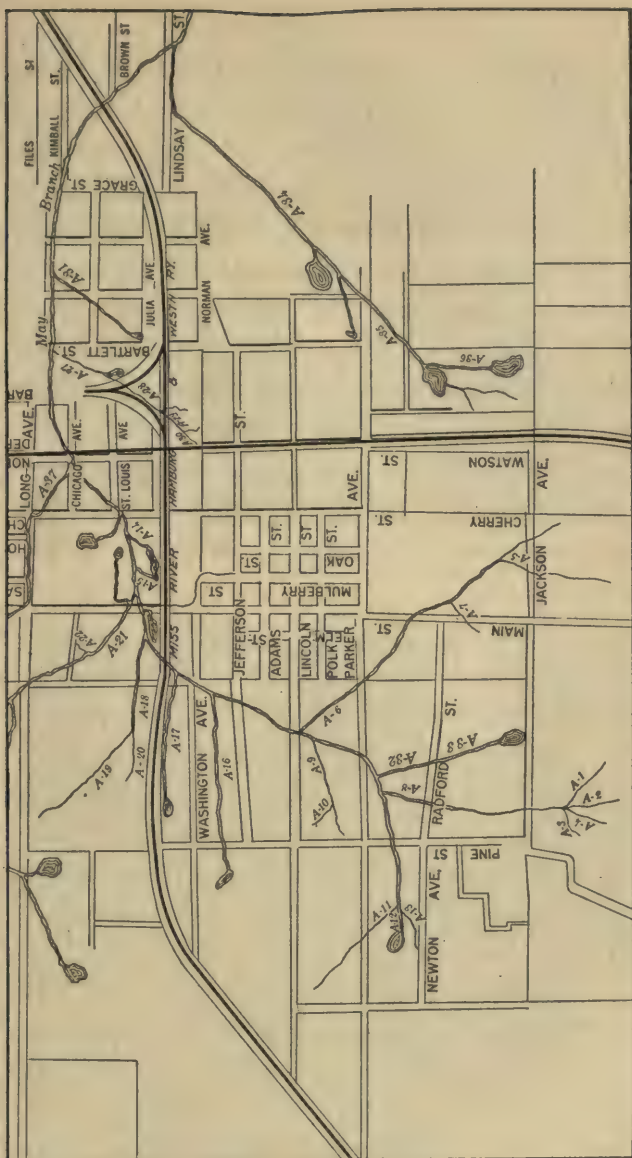


Fig. 42—Main Stream and Branches, with Location of Ponds. Antimalaria Operations. Hamburg, Arkansas

of the year, showed a reduction of 69.02 per cent. Physicians' calls for malaria reported monthly for 1917, as compared with the number of calls estimated from physicians' records for the previous year, showed a reduction of 88.75 per cent. The community bore about one-third the cost of the work and at the end of the year took it over, assuming entire responsibility for its continuance. The results and cost of the work may be conveniently summarized as follows:

Physicians' Calls for Malaria, Hamburg, Arkansas

	1916	1917
January	13	15
February	25	35
March	36	40
April	58	57
May	60	50
June	125	19
July	160	11
August	385	5
September	425	7
October	500	12
November	400	5
December	125	3
Total calls, 1916.....	2,312	
Total calls, 1917.....	259	
Percentage of reduction.....	88.75	
Per capita cost.....	\$1.45	

The one aim of all this work is the development of a synthetic program of malaria control



Fig. 43—Ideal Breeding-Place for Mosquitoes. Hamburg, Arkansas.
Before Being Drained



Fig. 44—Shallow Pond and Marshy Area. Hamburg, Arkansas.
Before Drainage Operations



Fig. 45—Borrow Pit. Hamburg, Arkansas. Before Being Drained



Fig. 46—The Same Borrow Pit. After Being Drained.

in which each of these several measures will be given its proper place. A plan of operation to be practicable must fall within limits of cost which the average community can afford. Under conditions where, for example, the cost of mosquito extermination is prohibitive, resort must be had to less expensive measures. With definite understanding of the possibilities and costs of the several lines of procedure, the director of the work will be in position to adapt means to ends with complete freedom and with a view to greatest efficiency and economy.

X

ERADICATION OF YELLOW FEVER

Since Reed's discovery that yellow fever is conveyed by the *Stegomyia* mosquito, now known as *Aedes Calopus*, the complete eradication of the disease has become largely a matter of local sanitation. Sanitarians are agreed that to accomplish this result it is necessary only to control the breeding-places of mosquitoes in the endemic centers of the infection. In order to locate these endemic foci, and to ascertain the practicability of undertaking measures for the eradication of the infection, the Board, in 1916, appointed a Yellow Fever Commission, with General Gorgas as its head. The Commission visited the regions of South America in which yellow fever has been reported or suspected in recent years and submitted a report of its findings. Owing to war conditions, it became necessary to suspend the operations which had been outlined and authorized for the year 1917.

During the past year outbreaks of yellow fever along the coast of the Caribbean Sea were reported. Dr. Juan Guiteras, a member of the Commission, investigated these reports. He visited the French Colony, Martinique, and

Maracaibo and Caracas in Venezuela, but found no authentic cases of the disease at these places. During the latter part of July, he found eight authentic cases at Coro, the capital of the State of Falcon. These cases were reported to the Venezuelan Government, with the result that steps were at once taken to eradicate the infection not only from Coro but from the entire State of Falcon.

XI

PUBLIC HEALTH TRAINING IN BRAZIL

Following the report of a special commission sent to Brazil in 1916 to study medical conditions, the Board entered into an arrangement with the *Faculdade de Medicina e Cirurgia* at Sao Paulo for the establishment of a Department of Hygiene in that institution. The new Department—the first of its kind in Brazil—is to be maintained jointly by the Medical School and the Board for a period of five years, with the understanding that if at the end of that time it has justified itself, Government will assume its support. Dr. S. T. Darling, who served with General Gorgas on the Canal Zone, and Dr. W. G. Smillie, of the Harvard School of Public Health and the Rockefeller Institute, have been appointed Director and Assistant Director, respectively, to have charge of the work during its initial stages.

Meantime, the Board is providing for the training of two Brazilian physicians in the Hopkins School of Hygiene and Public Health. It is expected that upon completion of their studies they will return to Brazil and serve in the De-

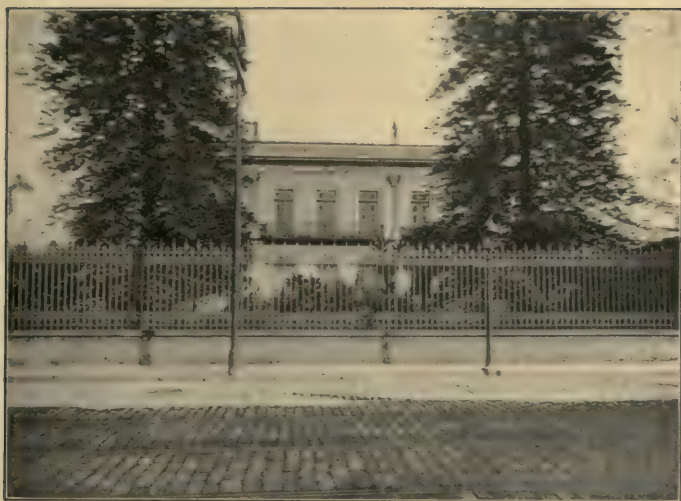


Fig. 47—Building Used by New Department of Hygiene. Faculdade de Medicina e Cirurgia. Sao Paulo, Brazil. Front View



Fig. 48—Another View of the Same Building



Fig. 49—Hospital Ship "Busuanga." Philippine Islands



Fig. 50—Ward of Hospital Ship "Busuanga"

partment of Hygiene at Sao Paulo. The Medical School has provided adequate quarters for the new Department (See Figs. 47 and 48, page 201) and has arranged to inaugurate the work in March, 1918. It is expected that the Department will, from the beginning, undertake, in a modest way, both the cultivation of hygiene as a science and the training of men for the application of its principles in the control of disease.

XII

HOSPITAL SHIP IN THE SULU ARCHIPELAGO

The medical work carried on through hospitals and dispensaries on the island of Mindanao (the Philippines), proved to be so successful that the extension of similar benefits to the outlying islands of the Sulu Sea appeared highly desirable. The International Health Board, therefore, entered into an agreement with the Government of the Philippine Islands to equip a hospital ship for the purpose of demonstrating the value of a mobile dispensary service operating from a base hospital. It was further agreed that the Board would contribute towards the expense of its maintenance for a period of five years.

The ship, which went into commission November 12, 1917, is of about 300 tons and is provided with an internal combustion engine, which reduces costs for a vessel making frequent stops. It is equipped with a modern operating room, ward for ten beds, pharmacy, and quarters suitable for life on the tropic seas (See Figs. 50 and 51, page 144). It carries, besides the crew, a medical personnel consisting of the doctor in charge, an assistant, a chief nurse,

and four other nurses. The plan is for the ship to make port at night and cruise during the day among the islands of the Sulu Archipelago, establishing relations with its inhabitants. Dispensary work will be done largely on shore. Lesser operations will be performed on the ship, and more serious cases will be taken to one of the base hospitals, either at Jolo or Zamboanga.

TABULAR SUMMARY

TABLE 4: *All Countries—Persons Enumerated in Census, Microscopically Examined, Found Infected, Given First Treatment, and Cured of Hookworm Disease in Areas Completed During 1917, By Geographical Regions. Figures Excluded for Areas in Which Work Was Still in Progress.*

GEOGRAPHICAL REGION	CENSUS	MICRO- SCOPICALLY EXAMINED		FOUND INFECTED		GIVEN FIRST TREATMENT		CURED	
		Number	Per Cent.	Number	Per Cent.	Number	Per Cent.	Number	Per Cent.
Total.....	..	304,400	..	191,233	62.8	173,432	90.7	107,603	62.0
Southern States ¹	73,872	37,299	50.5	7,834	21.0	7,596	97.0	2,486	32.7
West Indies.....	80,417	75,294	93.6	45,688	60.7	42,411	92.8	36,124	85.2
Central America ².....	..	126,916	..	77,482	61.0	71,725	92.6	26,806	37.4
The East.....	..	64,891	..	60,229	92.8	51,700	85.8	42,187	89.0 ³

¹ During 1917, in the Southern States, the main emphasis was placed on the building and improving of latrines.

² In Central America the bulk of the work is by the dispensary plan. This does not afford opportunity for frequent reexaminations to determine cure. Consequently the percentage of persons known to be cured is low in comparison with other regions.

³ This figure omits dispensary work in Siam.

TABLE 5: Southern States—Persons Enumerated in Census, Microscopically Examined, Found Infected, Given First Treatment, and Cured of Hookworm Disease in Areas Completed During 1917, By States. Figures Excluded for Areas in Which Work was Still in Progress¹

STATE	CENSUS Number	MICRO- SCOPICALLY EXAMINED		FOUND INFECTED		GIVEN FIRST TREATMENT		CURED	
		Number	Per Cent.	Number	Per Cent.	Number	Per Cent.	Number	Per Cent.
Total.....	73,872	37,299	50.5	7,834	21.0	7,596	97.0	2,486	32.7
Alabama.....	2,997	564	18.8	47	8.3	47	100.0	6	12.8
Mississippi.....	17,982	14,874	82.7	4,348	29.2	4,223	97.1	536	12.7
North Carolina.....	19,322	9,048	46.8	2,057	22.7	1,984	96.5	1,149	57.9
Tennessee.....	9,333	856	9.2	129	15.1	126	97.7	18	14.3
Texas.....	10,223	7,084	69.3	1,058	14.9	1,021	96.5	631	61.8
Virginia.....	14,015	4,873	34.8	195	4.0	195	100.0	146	74.9

¹ During 1917, in the Southern States, the main emphasis was placed on the building and improving of latrines.

TABLE 6: *West Indies—Persons Enumerated in Census, Microscopically Examined, Found Infected, Given First Treatment, and Cured of Hookworm Disease in Areas Completed During 1917, By Countries. Figures Excluded for Areas in Which Work Was Still in Progress*

COUNTRY	CENSUS Number	MICRO- SCOPICALLY EXAMINED		FOUND INFECTED		GIVEN FIRST TREATMENT		CURED	
		Number	Per Cent.	Number	Per Cent.	Number	Per Cent.	Number	Per Cent.
Total	80,417	75,294	93.6	45,688	60.7	42,411	92.8	36,124	85.2
Antigua	15,140	11,122	73.5	690	6.2	580	84.1	535	92.2
British Guiana	16,382	16,044	97.9	9,508	59.3	8,906	93.7	7,505	84.3
Dutch Guiana	13,256	13,159	99.3	12,045	91.5	11,133	92.4	10,102	90.7
Grenada	7,974	7,810	97.9	5,242	67.1	4,902	93.5	3,894	79.4
Saint Lucia	4,617	4,601	99.7	3,060	66.5	2,962	96.8	2,653	89.6
Saint Vincent	9,024	8,997	99.7	5,702	63.4	5,355	93.9	4,849	90.6
Trinidad	14,024	13,561	96.7	9,441	69.6	8,573	90.8	6,586	76.8

TABLE 7: *Central America—Persons Enumerated in Census, Microscopically Examined, Found Infected, Given First Treatment, and Cured of Hookworm Disease in Areas Completed During 1917, By Countries. Figures Excluded for Areas in Which Work Was Still in Progress¹*

COUNTRY	CENSUS Number	MICRO- SCOPICALLY EXAMINED		FOUND INFECTED		GIVEN FIRST TREATMENT		CURED	
		Number	Per Cent.	Number	Per Cent.	Number	Per Cent.	Number	Per Cent.
Total.....	..	126,916	..	77,482	61.0	71,725	92.6	26,806 ²	37.4
Costa Rica.....	..	48,488	..	29,940	61.7	28,909	96.6	12,971	44.9
Guatemala.....	13,993	12,934	92.4	7,095	54.9	6,693	94.3	5,997 ²	89.6
Nicaragua.....	..	33,781	..	18,422	54.5	16,950	92.0	1,280	7.6
Panama.....	18,359	16,676	90.8	14,088	84.5	13,262	94.1	3,617	27.3
Salvador.....	16,980	15,037	88.6	7,937	52.8	5,911	74.5	2,941	49.8

¹ In Central America the bulk of the work is by the dispensary plan. This does not afford opportunity for frequent reexaminations to determine cure. Consequently the percentage of persons known to be cured is low in comparison with other regions.

² In Guatemala the staff does not remain in an area long enough after treatment to make the number of persons negative on reexamination a reliable index of the number of persons cured.

TABLE 8: *The East—Persons Enumerated in Census, Microscopically Examined, Found Infected, Given First Treatment, and Cured of Hookworm Disease in Areas Completed During 1917, By Countries. Figures Excluded for Areas in Which Work Was Still in Progress*

COUNTRY	CENSUS	MICRO-SCOPICALLY EXAMINED		FOUND INFECTED		GIVEN FIRST TREATMENT		CURED	
		Number	Per Cent.	Number	Per Cent.	Number	Per Cent.	Number	Per Cent.
Total .....	..	64,891	..	60,229	92.8	51,700	85.8	42,187	89.0 ¹
Ceylon	48,176	42,828	88.9	41,613	97.2	35,675	85.7	31,382	88.0
Fiji	3,505	3,434	98.0	3,088	89.9	3,010	97.5	2,794	92.8
Seychelles	8,133	8,111	99.7	7,778	95.9	7,600	97.7	7,011	92.3
Siam (dispensary plan) .....	..	10,518	..	7,750	73.7	5,415	69.9	1,000	18.5

¹ This figure omits dispensary work in Siam.

FINANCIAL STATEMENT

FINANCIAL STATEMENT

The statement on the following pages shows that in the work of the International Health Board during the year 1917, a total of \$588,158.19 was expended. This statement is based on expenditures actually made during the calendar year, 1917, regardless of when financial reports were received at the New York office. It will be seen that the figures differ from those given in the Treasurer's statement on pages 281 to 344. The Treasurer's Report includes amounts paid in the field during the first three quarters of 1917, to which in many instances have been added amounts paid during the fourth quarter of 1916, but not recorded until early in 1917. This discrepancy between the two reports is caused by the necessity of closing the Treasurer's books shortly after the first of the calendar year, before detailed financial reports can be received from the foreign countries in which a large part of the work of the Board is conducted.

TABLE 9: *Expenditures of International Health Board During the Year 1917*

FIELDS OF ACTIVITY	Amount Expended
Grand Total	\$588,158.19
RELIEF AND CONTROL OF HOOKWORM DISEASE	360,862.75
MALARIA CONTROL.....	39,978.58
YELLOW FEVER CONTROL.....	9,344.03
UNCINARIASIS COMMISSION TO ORIENT.....	16,572.64
TUBERCULOSIS IN FRANCE.....	52,269.33
MEDICAL AND PUBLIC HEALTH EDUCATION.....	12,416.63
INVESTIGATION OF SEWAGE DISPOSAL AT RURAL HOMES.....	5,359.11
FIELD STAFF SALARIES, EXPENSES, AND AUTO- MOBILES, NOT PRO-RATED TO SPECIFIC BUDGETS	7,188.81
MISCELLANEOUS.....	8,454.08
ADMINISTRATION.....	75,712.23
RELIEF AND CONTROL OF HOOKWORM DISEASE:	
Southern States.....	53,679.07
West Indies.....	86,529.25
Central America.....	99,621.74
South America.....	43,309.16
The East.....	77,723.53
Southern States:	
Alabama.....	1,235.97
Arkansas.....	2,462.60
Georgia.....	2,436.95
Kentucky.....	2,200.00
Louisiana.....	1,278.66
Maryland.....	182.95
Mississippi.....	9,223.36
North Carolina.....	8,548.71
South Carolina.....	7,967.22
Tennessee.....	6,635.02
Texas.....	5,170.48
Virginia.....	6,337.15
West Indies:	
Administration.....	6,811.29
Antigua.....	4,758.87
British Guiana*.....	17,996.36
Cayman Islands (Survey).....	1,795.16
Dutch Guiana*.....	19,168.40
Grenada.....	7,778.80
St. Lucia.....	6,865.60

* For administrative reasons, British and Dutch Guiana, although on the mainland of South America, are considered West Indian Colonies.

TABLE 9: *Expenditures of International Health Board During the Year 1917—Continued*

FIELDS OF ACTIVITY	Amount Expended
RELIEF AND CONTROL OF HOOKWORM DISEASE —Continued	
St. Vincent.....	\$9,384.18
Tobago (Survey).....	1,072.22
Trinidad.....	10,898.37
Central America:	
Costa Rica.....	21,752.31
Guatemala.....	13,346.70
Nicaragua.....	19,418.74
Panama.....	22,881.75
Salvador.....	22,222.24
South America:	
Brazil.....	43,309.16
The East:	
Administration.....	10,298.21
Ceylon.....	39,723.72
China.....	3,981.58
Fiji Islands.....	5,776.92
Papua and Queensland (Survey).....	4,074.84
Seychelles Islands.....	7,409.69
Siam.....	6,458.57
MALARIA CONTROL:	
Arkansas.....	4,276.23
Mississippi.....	35,702.35
MISCELLANEOUS:	
Traveling Expenses, Families of Field Staff..	2,000.00
Drugs for Conserving Health of Field Staff...	43.49
Field Equipment and Supplies.....	2,464.68
Pamphlets and Charts.....	1,335.66
Conference of Health Officers of Southern States.....	2,073.40
Express, Freight, and Exchange.....	536.85
ADMINISTRATION:	
Home Office.....	61,857.66
Survey and Exhibit.....	13,854.57

CHINA MEDICAL BOARD

Report of the General Director

To the President of The Rockefeller Foundation:
Sir:—

I have the honor to submit herewith my report as General Director of the China Medical Board for the period January 1, 1917, to December 31, 1917.

Respectfully yours,
WALLACE BUTTRICK,
General Director.

CHINA MEDICAL BOARD

OFFICERS

Chairman

GEORGE E. VINCENT

General Director

WALLACE BUTTRICK

Resident Director in China

ROGER S. GREENE

Secretary

EDWIN R. EMBREE

MEMBERS

*Wallace Buttrick

*Simon Flexner

Frederick L. Gates

Frank J. Goodnow

Roger S. Greene

Harry Pratt Judson

John R. Mott

*Starr J. Murphy

Francis W. Peabody

John D. Rockefeller, Jr.

*Wickliffe Rose

*George E. Vincent

William H. Welch

*Member of Executive Committee.

TRUSTEES OF THE PEKING UNION MEDICAL COLLEGE

OFFICERS

Chairman

JOHN R. MOTT

Vice-Chairman

JAMES L. BARTON

Secretary

WALLACE BUTTRICK

Executive Committee

George E. Vincent, *Chairman*

Arthur J. Brown
Wallace Buttrick

Simon Flexner
Frank Mason North

MEMBERS

To Serve Until the Annual Meeting of 1920

Arthur J. Brown
Wallace Buttrick

James Christie Reid
George E. Vincent

To Serve Until the Annual Meeting of 1919

F. H. Hawkins
Frank Mason North

Wickliffe Rose
William H. Welch

To Serve Until the Annual Meeting of 1918

J. Auriol Armitage
James L. Barton

Simon Flexner
John R. Mott

John D. Rockefeller, Jr.

These members have been elected as follows:

By the Rockefeller Foundation

Wallace Buttrick
Simon Flexner
John R. Mott

John D. Rockefeller, Jr.
Wickliffe Rose
George E. Vincent

William H. Welch

By the London Missionary Society

F. H. Hawkins

By the Medical Missionary Association of London

James Christie Reid

By the American Board of Commissioners for Foreign Missions

James L. Barton

By the Society for the Propagation of the Gospel in Foreign Parts

J. Auriol Armitage

By the Board of Foreign Missions of the Methodist Episcopal Church

Frank Mason North

*By the Board of Foreign Missions of the Presbyterian Church in the
United States of America*

Arthur J. Brown

TRUSTEES OF
THE SHANGHAI MEDICAL SCHOOL
OF THE
ROCKEFELLER FOUNDATION

OFFICERS

Chairman

GEORGE E. VINCENT

Vice-Chairman

JOHN W. WOOD

Secretary

WALLACE BUTTRICK

Executive Committee

George E. Vincent, *Chairman*

Wallace Buttrick
Simon Flexner

Starr J. Murphy
Robert E. Speer

MEMBERS

To Serve Until the Annual Meeting of 1921

Robert E. Speer
George E. Vincent

William H. Welch
John W. Wood

To Serve Until the Annual Meeting of 1920

Simon Flexner
Frederick L. Gates

Starr J. Murphy
Francis W. Peabody

To Serve Until the Annual Meeting of 1919

Fletcher S. Brockman

Walter B. Cannon

Wallace Buttrick

WORK OF THE YEAR

The China Medical Board has continued during the year 1917 to carry out its program of assistance in the development of a comprehensive and adequate system of medicine in China. Substantial progress has been made in organizing the faculty and in constructing the buildings of the Peking Union Medical College, one of the two centers of modern medical education which it is planned to establish in China. At the same time the Board has continued its assistance to existing medical schools and hospitals in that country and has continued to make possible, by fellowships and scholarships, advanced medical study in America by medical missionaries and Chinese physicians and nurses.

I. THE PEKING UNION MEDICAL COLLEGE

The outstanding feature of the year has been the progress in the creation of the medical center in Peking. On September 24, 1917, the cornerstone of the new buildings was laid. The ceremony was performed by the Chinese Minister of Education, Mr. Fan Yuan-lien, and addresses were made by Lieut.-Col. Frank Billings, M.D., of Chicago, by His Excellency Dr. Paul S. Reinsch, the American Minister to China, and by Dr. Franklin C. McLean, the Director of the school. (See Figure 52, page 226.) The construction of this large group of laboratories, lecture and demonstration rooms, hospital wards, service buildings and staff residences is progressing rapidly. While the buildings will embody all the approved features of a modern medical center, the external forms have been planned in harmony with the best tradition of Chinese architecture. They thus symbolize the purpose to make the College not something foreign to China's best ideals and aspirations, but an organism which will become a part of a developing Chinese civilization.

The group will include separate buildings for pathology and bacteriology, pharmacology and



Fig. 51—Peking Union Medical College. Now in Course of Construction



Fig. 52.—Laying Corner-Stone of Peking Union Medical College

physiological chemistry, a hospital with medical and surgical departments and a nurses' training school, an outpatient department, an administration building, a building for religious and social meetings and recreation, and dormitories for students. On land near but not adjoining the campus, two groups of houses will be built for the use of the members of the teaching staff.

The building up of the faculty for the school has been proceeding throughout the year. Dr. Franklin C. McLean, who in 1916 was appointed Director, has selected and recommended to the Board a number of well qualified men who form the nucleus of a strong teaching staff. An announcement of the purposes and plans of the Peking Medical School has been authorized and will appear in the near future.

FACULTY OF PEKING UNION MEDICAL COLLEGE

The members of the faculty¹ of the Peking Union Medical College, appointed during the year are as follows:

Franklin C. McLean, Ph.D., M.D. Director, professor, and head of the department of medi-

¹ From January 1, 1918, to the date at which this goes to press the following further appointments have been made to the faculty of the Medical College and the Pre-Medical School:

Henry S. Houghton, Ph.B., M.D. Acting Resident Director.

Adrian S. Taylor, M.D. Professor and head of the department of surgery.

cine (appointed 1916). Age 30. Unmarried, Presbyterian. University of Chicago, B.S., 1907, M.S., 1912, Ph.D., 1915. Rush Medical College, M.D., 1910. Assistant Resident Physician, Hospital of the Rockefeller Institute, 1914-16.

E. V. Cowdry, Ph.D. Professor and head of the department of anatomy. Age 30. Married. Church of England. University of Toronto, B.A., 1909. University of Chicago, Ph.D., 1912. Associate in anatomy, Johns Hopkins University, 1913-1917.

Bernard E. Read, Ph.C., M.S. Associate professor of physiological chemistry. Age 30. Single. Congregationalist. Yale, M.S., 1918. Con-

Harvey J. Howard, B.A., M.D., D.Oph. Professor and head of the department of ophthalmology.

Ralph G. Mills, B.A., M.D. Professor and head of the department of pathology.

Ernest Grey, M.D. Professor of surgery.

Davidson Black, B.A., M.B. Professor of embryology and neurology.

A. M. Dunlap, B.A., M.D. Associate professor of otology, rhinology and laryngology.

E. T. H. Tsen, M.D. Associate in bacteriology.

William G. Lennox, B.A., M.D. Associate in medicine.

Frederick E. Dilley, M.D. Associate in surgery.

Ernest M. Johnstone, B.S., M.D. Associate in surgery.

T. M. Li, M.D. Associate in ophthalmology.

S. Y. Wong, B.S., M.S. Assistant in physiological chemistry.

Odd Eckfelt, B.A., M.D. Assistant in medicine.

Way Sung New, B.A., M.D. Assistant in surgery.

Donald E. Baxter, M.D. Business manager.

A. J. D. Britland, M.P.S. Pharmacist.

Philip A. Swartz, B.A., B.D. Director of religious work.

Miss Emily Gilfillan, B.A. Librarian.

THE PRE-MEDICAL SCHOOL

A. E. Zucker, B.A. Instructor in English and German.

Ma Kiam, Hsiu-ts'ai. Instructor in Chinese.

Miss Alice M. Boring, Ph.D. Assistant in biology.

Y. T. Tong, B.S. Assistant in physics.

nected with the Union Medical College under former management, 1909-1916.

Charles W. Young, B.S., M.D. Associate in medicine. Age 43. Married. Congregationalist. University of Illinois, B.S., 1897. Johns Hopkins Medical School, M.D., 1903. Connected with the Union Medical College under former management, 1906-1916. Dean of Union Medical College for several years.

H. Jocelyn Smyly, M.A., M.D., F.R.C.S.I. Associate in medicine. Age 35. Single. Church of Ireland. Trinity College of Dublin University, undergraduate and medical work. Appointed to Union Medical College faculty under former management in 1913.

John H. Korns, B.A., M.D. Associate in medicine. Age 34. Married. Methodist. Ohio Wesleyan University, B.A., 1904. Rush Medical College, M.D., 1909. Taianfu Men's Hospital, Taianfu, Shantung, 1911-15. Appointed to Union Medical College faculty under former management, 1915.

Frederick H. Dieterich, B.S., M.D. Assistant in Surgery. Age 30. Single. Presbyterian. Columbia College, B.S., College of Physicians and Surgeons of Columbia University, M.D.

Dr. McLean, the Director of the Peking Union Medical College, has been requisitioned by the

United States Government as a physician, and has been serving during the latter part of the year in connection with the office of the Surgeon General of the Army in Washington, and in various field assignments.

PRE-MEDICAL SCHOOL AT PEKING

In September, 1917, the Pre-Medical School was opened, housed in the remodeled buildings of the former Union Medical College. These buildings, which have been altered and thoroughly equipped for their present use, are situated near the new Medical School group.

The purpose of the school is to prepare for the courses in the Medical College. Students are admitted on examination after graduation from a middle school. As all instruction in the Pre-Medical School, with the exception of that in Chinese composition and literature, is in English, only those students who can read, write, and speak English are admitted. A three-year course in English, Chinese, German, mathematics, physics, chemistry, and biology is offered. On the successful completion of this course, students will receive certificates which entitle them to admission to the Peking Union Medical College without further examination. The courses offered in the Pre-Medical School are of college

grade. Students who have completed, elsewhere, one or more years of college work after graduation from a middle school, may be admitted to advanced standing in the Pre-Medical School, and the course of study required for admission to the Medical College will be correspondingly shortened. Eight students were enrolled at the opening of the Pre-Medical School. By the time they are prepared for entrance, the Medical College will have opened its doors.

FACULTY OF THE PRE-MEDICAL SCHOOL

The following are the present members of the faculty of the Pre-Medical School at Peking:

William W. Stifler, Ph.D. Dean and Instructor in physics. Age 35. Married. Baptist. Shurtleff College, B.A., 1902. University of Illinois, M.A., 1908, Ph.D., 1911. From 1911 to 1916 instructor in physics at Columbia University.

Stanley D. Wilson, Ph.D. Instructor in chemistry. Age 36. Unmarried. Methodist. Wesleyan University, B.A., 1909, M.A., 1910. University of Chicago, Ph.D. (Chemistry), 1916. Instructor in chemistry, University of Chicago, 1914-16. Instructor in organic chemistry, Rice Institute, Houston, Texas, 1916-17.

Charles W. Packard, Ph.D. Instructor in bi-

ology. Age 33. Married. Congregationalist. Syracuse University, B.S., 1907, M.S., 1908. Columbia University, Ph.D., 1914. Instructor in biology in Columbia since 1914.

Luther Carrington Goodrich, B.A. Instructor in English. Age 23. Appointed instructor in English for one year. Williams College, B.A., 1917.

C. T. Feng. Assistant in chemistry. Former assistant in chemistry under Mr. B. E. Read at the Union Medical College, 1915-16. Post-graduate course in chemistry at Weihsien, 1916-17, with Dr. W. H. Adolph.

II. THE SHANGHAI MEDICAL SCHOOL

Progress has also been made during the year in plans for the organization of the second medical center, that at Shanghai. On April 12, 1917, the Trustees of this School were incorporated under a provisional charter granted by the University of the State of New York under the corporate name "Shanghai Medical School of the Rockefeller Foundation." The following persons are the incorporating trustees: Fletcher S. Brockman, Wallace Buttrick, Walter B. Cannon, M.D., Simon Flexner, M.D., Frederick L. Gates, M.D., Starr J. Murphy, Francis W. Peabody, M.D., Robert E. Speer, George E. Vincent, William H. Welch, M.D., and John W. Wood.

A meeting of the Trustees was held on May 18, when the charter was accepted and by-laws adopted. George E. Vincent was elected Chairman, John W. Wood, Vice-Chairman, and Wallace Buttrick, Secretary. Dr. Henry S. Houghton was appointed Acting Dean.

Plans for the buildings in Shanghai have been under consideration, but it is not expected that actual operations will be begun, or that definite steps will be taken toward securing a faculty, until the close of the war.

The question of the preparation of students who may wish to enter the Shanghai Medical School has been considered at length. The Board has decided not to establish its own preparatory school, as in Peking, but to cooperate with selected colleges and universities in the vicinity in strengthening their work in science and other pre-medical subjects. In reaching this decision, the Board has been influenced by the fact that there are in the general field of the Shanghai School, anxious to cooperate in this work, colleges whose standards of work are high.

To this end, appropriations have been made to enlarge the science department and to provide additional instructors at the Fukien Christian University situated at Foochow, Fukien Province, about 300 miles south of Shanghai, and connected with it by direct steamship service. The officers were authorized also to negotiate with the St. John's University of Shanghai with a view to aiding its scientific department. Appropriations may be made later to other institutions.

III. AID TO EXISTING MEDICAL SCHOOLS IN CHINA

It is expected that the chief contributions of the China Medical Board to medicine in China will be rendered through the large, modern centers being established at Peking and Shanghai. However, the Board has also been giving aid to medical education by contributions to existing medical schools of high standard and of strategic importance. Such support was continued during the year to the Hunan-Yale Medical School, Changsha, to the Tsinanfu Union Medical College, and to St. John's University of Pennsylvania Medical School in Shanghai.

To the Hunan-Yale School, an institution situated in Central China supported jointly by Yale alumni and the government of Hunan Province, the Board has contributed since 1915. During the year 1917 two new appropriations were made to this school: the sum of \$9,000 toward a total of \$16,125 for an extension of the school budget, and the sum of \$6,200 toward the support of instruction in the Pre-Medical Department. These appropriations each cover three years and are to be paid in annually decreasing amounts,

The medical work at St. John's University in Shanghai will be discontinued when the Shanghai Medical School is opened. Meanwhile, the China Medical Board is continuing to aid the University by contributing the salary of the instructor in anatomy.

IV. SUPPORT OF MISSIONARY HOSPITALS

The Board has continued during the year to aid important missionary hospitals by making it possible for them to increase their medical staffs and to improve their equipment and plant. Contributions by the Board to missionary hospitals are conditioned upon the providing, by the supporting societies, of at least one-fourth of the total sum desired for increase of staff, equipment, or plant.

Grants have been made to the following missionary hospitals, the details of which will be found in the Treasurer's Report (See pages 281 to 344):

<i>Missionary Society</i>	<i>Place</i>
American Board of Commissioners for Foreign Missions	Tehchow, Shantung
Board of Foreign Missions of the Methodist Episcopal Church.	Peking, Chihli Tientsin, Chihli Wuhu, Anhwei
Board of Foreign Missions of the Presbyterian Church in the U. S. A.	Chefoo, Shantung Paotingfu, Chihli
Foreign Christian Missionary Society	Luchowfu, Anhwei Nantungchow, Kiangsu
Medical Mission Auxiliary of the Baptist Missionary Society (English)	Taiyuanfu, Shansi
United Free Church of Scotland	Mukden, Manchuria

Most of these hospitals had previously received appropriations from the Board. In some cases these appropriations are additional to the original grants; in other cases they are for new undertakings in connection with the same hospitals. This is in accordance with the Board's policy of strengthening hospitals which are already doing excellent work, with the idea that graduates of the future medical schools may serve their internships at these hospitals. Payments have not yet been called for on all these appropriations, for the missionary societies cannot always secure the personnel desired, especially at the present time on account of the war.

V. FELLOWSHIPS AND SCHOLARSHIPS

Thirty-one medical missionaries on furlough and 12 Chinese doctors have been studying in the United States during the past year on scholarships or fellowships supplied by the China Medical Board. Seven of the medical missionaries have studied at the Harvard Medical School, three at the Johns Hopkins Medical School, three at the University of Pennsylvania, three at the Mayo Clinic, three at the New York Post-Graduate Hospital, two at the Rush Medical School, and two at the Cook County Hospital in Chicago. Also one fellowship holder for either part-time or full-time has been at each of the following institutions: Columbia University, McGill University, Philadelphia Women's Medical College, Peter Bent Brigham Hospital, Philadelphia Polyclinic Hospital, Massachusetts General Hospital, Massachusetts Charitable Eye and Ear Infirmary, Boston Lying-In Hospital, Boston Children's Hospital, New York Presbyterian Hospital, and Chicago Presbyterian Hospital. Of the Chinese doctors, five have studied at the Harvard Medical School, three at the Philadelphia Polyclinic Post-Graduate School and Hospital, two at Johns Hopkins, two at the University of Pennsylvania, one at the

College of Physicians and Surgeons of Columbia University, one at the Massachusetts General Hospital, and one at the Boston City Hospital.

The following missionary doctors and nurses were granted fellowships during the year:

- T. W. Ayers*, Southern Baptist Hospital, Hwanghien.
L. R. Boutwell, Foreign Christian Missionary Hospital, Luchowfu.
N. Worth Brown, Nanking Hospital, Nanking.
A. M. Dunlap, Formerly of Harvard Medical School of China, Shanghai.
Nina D. Gage, Yale Hospital, Changsha.
J. S. Grant, American Baptist Hospital, Ningpo.
Charles A. Hayes, Southern Baptist Hospital, Wuchow.
Paul V. Helliwell, Canadian Church Hospital, Kweitah.
W. G. Hiltner, Nanking Hospital, Nanking.
Harvey J. Howard, Formerly of Canton Hospital, Canton.
J. Charles Humphreys, American Baptist Hospital, Ningyuenfu.
Mary L. James, American Episcopal Hospital, Wuchang.
John H. Korns, Peking Union Medical College, Peking.
Claude M. Lee, American Episcopal Hospital, Wusih.
C. B. Leshner, American Baptist Hospital, Chaoyang.
Stephen C. Lewis, American Presbyterian Hospital, Chenchow.
Mabel A. McCracken, American Methodist Hospital, Wuhu.
E. I. Osgood, Foreign Christian Missionary Hospital, Chenchow.
W. H. Park, Southern Methodist Hospital, Soochow.
W. W. Peter, Medical Missionary Association, Shanghai.
 (Public Health Education.)
Ethel Polk, Southern Methodist Hospital, Soochow.
B. E. Read, Peking Union Medical College, Peking.
J. E. Skinner, American Methodist Hospital, Yenpingfu.
Adrian S. Taylor, Formerly of Southern Baptist Hospital, Yangchow.
J. Oscar Thomson, Canton Hospital, Canton.



Fig. 53—Medical Education and Other Medical Work in China Supported or Assisted by China Medical Board

J. G. Vaughan, American Methodist Hospital, Nanchang.

Paul Wakefield, Foreign Christian Missionary Hospital, Luchowfu.

Andrew H. Woods, Canton Christian College, Canton.

R. MacLean Gibson, London Mission Hospital, Hongkong.

Ernest M. Johnstone, Peking Union Medical College, Peking.

R. V. Taylor, Southern Baptist Hospital, Yangchow.

F. F. Tucker, American Board Hospital, Tehchow.

The following Chinese doctors received appropriations during the year: E. T. Hsieh, Edward Young Kau, Tsing-Liang Li, C. C. Liao, Liu Jui-hua, Way Sung New, Sze-jen Shen, Liyuin Tsao, E. T. H. Tsen, Arthur Waitah Woo, L. S. Woo, F. C. Yen, and Grace Yoh. Dr. Tsao, Dr. Arthur Woo, and Dr. L. S. Woo have not yet arrived in this country to take up their studies. Dr. George Y. Char and Dr. Peter C. Kiang have studied during 1917 under fellowships granted in 1916.

Seven of the former students of the Harvard Medical School of China are completing their medical education in the United States at the expense of the China Medical Board, one of whom is working at the Johns Hopkins and the rest at the Harvard Medical School in Boston.

Three Chinese pharmacists, Messrs. Charles T. Cheng, Hsi Yin-dah, and George K. How, who have been in this country for the past year

studying at the University of Maryland, were granted extensions of their scholarships.

Miss Elizabeth Sze and Miss Lillian Wu are continuing their nursing training at the Johns Hopkins Hospital, and Miss Winifred Mooney of the Red Cross General Hospital, Shanghai, is about to take up work at the Massachusetts General Hospital. Appropriations have been made for two other Chinese nurses from the Red Cross General Hospital to come to the United States for further training.

TRANSLATION

Small grants have been made to the Nurses' Association of China for the translation of nursing textbooks, and to the Publication Committee of the China Medical Missionary Association for an increase in the salary of the Chinese pundit who is working with Dr. P. B. Cousland on the translation of medical textbooks.

LOSS IN EXCHANGE

The marked increase in the cost of silver currency has created a problem which all organizations interested in China are obliged to face. Three years ago it was possible to purchase as much as \$2.50 Mexican currency for one Ameri-

can gold dollar, but now \$1.50 or \$1.75 is as high an exchange as can be secured. This, of course, has greatly increased the cost of the buildings that are being constructed, because Chinese currency must be used for the materials purchased in China and for the wages of the workmen.

Action has been taken by the Board to provide for its representatives and teachers in China an exchange rate of two Mexican dollars for one gold dollar, and at the urgent request of the missionary boards who have made similar arrangements for their employees, the Board appropriated a sum sufficient to give to all the missionary boards this exchange rate on all payments made to them by the China Medical Board during the year.

MISCELLANEOUS

The General Director was absent in Great Britain for the five months ended in November. During his absence Dr. Henry S. Houghton acted as General Director.

The Resident Director in China gave a large part of his time, during the latter half of the year, to Red Cross work for the relief of sufferers from flood and famine in the region of Tientsin.

The Board has granted the Resident Director

a leave of absence with the understanding that he will return to this country on furlough as soon as the work in China will permit.

Dr. Houghton has returned to China to be in charge of the work there, during the absence of the Resident Director.

THE ROCKEFELLER INSTITUTE
FOR MEDICAL RESEARCH
SPECIAL WAR ACTIVITIES

Report of the Director of Laboratories

To the President of The Rockefeller Foundation:
Sir:—

I have the honor to submit herewith my report of the special war activities of the Rockefeller Institute for Medical Research, which have been supported by The Rockefeller Foundation for the period January 1, 1917, to December 31, 1917.

Respectfully yours,

SIMON FLEXNER,
Director of Laboratories.

WAR WORK OF THE ROCKEFELLER INSTITUTE FOR MEDICAL RESEARCH

The Rockefeller Foundation has made special appropriations to the Rockefeller Institute in order to enable the Institute to undertake certain war activities which it was in position to conduct with advantage. These activities are, indeed, for the most part outside the precise scope of the normal work of the Institute as designed by its Founder and Board of Trustees, and as carried into effect by the Board of Scientific Directors. The Institute was created for the purpose of promoting medical discovery through research. In accordance with the principles on which its work was constructed, it has left to other agencies the task of carrying into effect, on a large scale, any discoveries of practical utility which might be made there. However, the imminence of war with, and then later the actual declaration of war against Germany, led the corporation of the Institute to readjust its several kinds of activities in order to place the facilities of the institution on a war basis.

Fortunately, the Institute had made contributions looking toward the prevention and the curative treatment of disease which offered im-

mediate application to the medical problems likely to arise in connection with the greatly enlarged personnel of the Army and Navy, and with the inevitable casualties of large training camps and of actual warfare. For example, the Institute had worked out curative serums for epidemic meningitis and for one of the forms of pneumonia—both of which diseases have always appeared in greater or less force in large military organizations; also, under the support of The Rockefeller Foundation, Dr. Carrel (in conjunction with Dr. Dakin, the chemist) had perfected at Compiègne a method of treating infected surgical wounds which had come to have wide applicability in practice. It seemed, therefore, right and proper that the Rockefeller Institute should employ its resources in men and facilities to aid the Surgeons General of the Army and Navy in dealing with their large and important problems.

Moreover, the fact was patent that medical and allied problems, not yet solved, would call for work of investigation. The several laboratories of the Institute were so equipped in men and materials as to enable it to supplement the various research laboratories at the command of the Government. These resources were placed freely at the disposal of the Surgeons General and other governmental agencies, and have been



Fig. 54—War Demonstration Hospital at the Rockefeller Institute for Medical Research, New York. Funds Provided by The Rockefeller Foundation

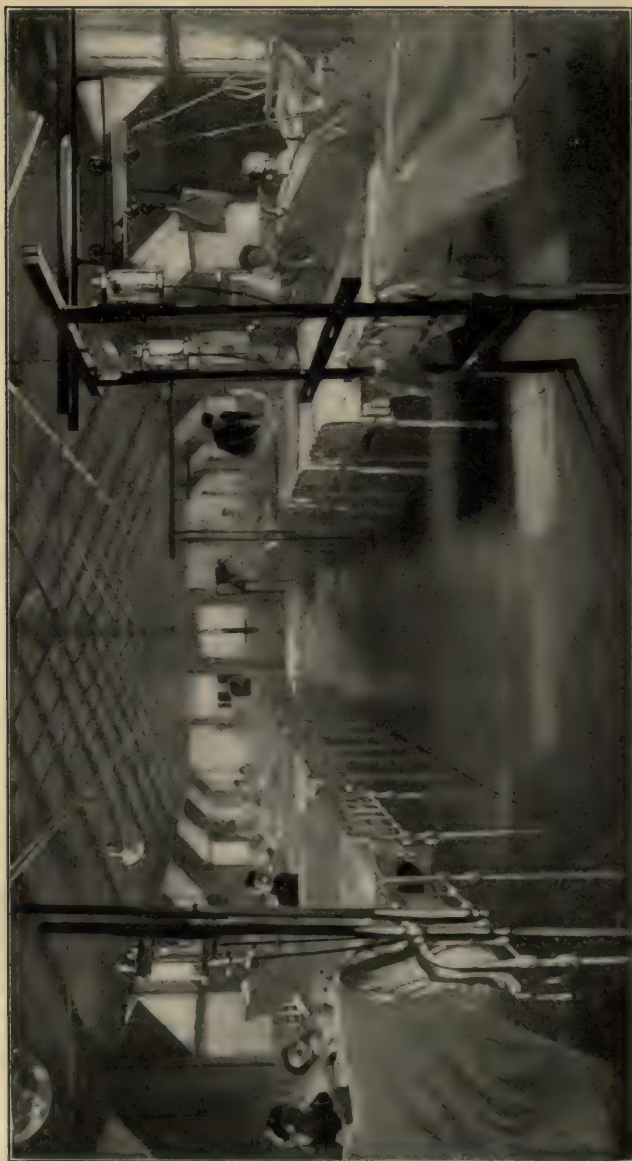


Fig. 55—Ward in Hospital Illustrating Carrel-Dakin Method of Sterilizing Wounds by Periodic Irrigation

employed on a wide variety of research problems.

Meanwhile, the staff of the Institute has suffered considerable depletion. This has been unavoidable and has been due to two causes. In the first place, a considerable number of the scientific staff insisted on going into active military service; in the second place, some of that staff were peculiarly qualified by special training to give their maximum service in connection with the expeditionary forces in France. All those staff officers are now on leave of absence. On the other hand, a nucleus has been reserved in order that the particular service which the Institute can render the Government should not be too seriously impaired. The Government has cooperated with the Institute in enabling this reserve to be maintained.

CARREL-DAKIN TREATMENT OF WOUNDS

Infected war wounds have been extremely numerous as a result of trench warfare. Because of this condition, tetanus was for a time very prevalent and, until recently, gaseous gangrene and suppuration all too common. The incidence of tetanus has been greatly diminished through the general employment of the anti-tetanic serum administered to wounded men as a prophylactic.

Of the various means introduced to deal with gaseous gangrene and suppuration, the Carrel-Dakin method is the one which has come to have the greatest application. The method involves two essential steps: first, the radical employment of an antiseptic made possible by the surgical conceptions of Dr. Carrel and the devices he invented; and second, the employment of an active antiseptic solution,—in this case a neutral solution of sodium hypochlorite devised by Dr. Dakin, which is brought into intimate and frequent application to the infected tissues.

The effects of the antiseptic are followed by a method of bacteriological control or computation introduced by Carrel. Microscopical preparations are made regularly from the surfaces of the wound, the bacteria present are counted, and the number found are charted. When under the influence of the treatment they fall to a certain average number, it is regarded as safe to close the wound surgically. By the employment of these measures the time factor has been materially reduced, and many lives and limbs have been saved which otherwise would have been lost.

PURPOSE OF WAR DEMONSTRATION HOSPITAL

The War Demonstration Hospital of the Rockefeller Institute was planned as a school

in which to teach military surgeons the art of applying the Carrel-Dakin treatment. The idea of a teaching hospital of this kind was conceived after the diplomatic break with Germany occurred and before war was actually declared against that country. Dr. Carrel was, fortunately, in this country at that critical time. He had returned for a brief period to the United States after having been in constant active service in France since the outbreak of the war. It was while he was in charge of the Army Hospital at Compiègne, the laboratory of which was supported by The Rockefeller Foundation, that the method of treatment bearing his and Dr. Dakin's names was perfected. The idea behind the conception of the War Demonstration Hospital was twofold: first, to afford facilities for teaching the surgical treatment of infected wounds; and, second, to construct a hospital on the best model of the base hospitals developed on the Western front. The first patient was received on July 26, 1917. Since that time, the hospital has been in constant operation. It has drawn its patients chiefly from the civilian community, but it has also drawn a number from the Army and Navy.

DESCRIPTION OF WAR DEMONSTRATION HOSPITAL

In constructing the War Demonstration Hospital, an endeavor was made to duplicate, on a small scale, the best model of the base hospital developed on the Western front. The unit building system patented by Humphreys, Ltd., of London, which has been employed in the base hospitals of the British Red Cross and St. John's Guild at Étaples, was adopted with certain modifications made necessary by American methods of construction.

The Hospital is essentially a portable structure. The units of which it is composed are five feet in length, with side-walls either eight or ten feet in height. Each of these panels is of double-wall construction, with an air-space between the outer and inner sheathing, thus furnishing insulation against both heat and cold. For roof trusses, a light steel rod system on five foot centres is used. This presents the minimum restriction to light, and effective head room. This particular type of knock-down construction permits elasticity in expansion and is also easily transported.

The plan of the two wards, each of 24-bed capacity, follows very closely that of an ordinary surgical hospital in peace times. Running north and south, the services are grouped at the north end so as to allow the free entrance of the winter

sun at the south end, which opens on a terrace covered in summer with awnings. On each side of the ward two wall panels, hinged at the bottom, are arranged to swing out to permit of rapid exit from the building in case of fire. These openings also furnish additional ventilation in hot weather. Each of the two buildings is 110 feet in length and 22 feet in width with side-walls eight feet in height. For the isolation of contagious cases, a separate small building is provided.

The operating pavilion lies east and west so as to ensure north light all along one side. For this building, 105 feet in length, the wider type of unit, 28 feet in width with walls ten feet high, has been adopted. At the east end is a large work room for nurses, and next to it a sterilizing room easily accessible from the operating room. The etherizing room gives access both to the operating and plaster rooms, while the west end of the building is occupied by the X-ray service with dark room, demonstration, and storage rooms.

For the reception and discharge of patients a separate building is provided. Here, before being admitted to the wards, all the wounded are cleaned, and their histories taken. Their soiled clothing is removed in bags to the laundry building, for disinfection and washing, and hospital

clothes are substituted. Storage compartments are provided at the east end of this building for the cleaned clothing and personal effects, which are returned to the patient upon his discharge.

As far as the limited boundaries of the site permit, the pavilions for the nurses and maids and the dormitory for the orderlies are isolated. Each of these three buildings is 22 feet in width with standard side-walls eight feet high. They accommodate 18 nurses, eight orderlies, and seven maids.

While a hospital of this small capacity—at most 66 beds—would not ordinarily justify a separate steam kitchen and laundry, these have been included in view of the special object of this undertaking. The kitchen is equipped with coal ranges, steam vegetable cookers, and a stock kettle. Refrigeration is supplied to the storage boxes by a portable compression refrigerating plant. A dishwashing plant is installed in one section of the kitchen to which all china is returned from the wards and mess rooms.

The laundry building has two receiving rooms: one is for infected clothing, linen, and bedding, which must pass through either the sterilizing washer or the steam and formaldehyde sterilizer; the other is for ordinary soiled linen. Mattresses and pillows, after sterilization, are stored at the west end of the building, while the linen,

after drying and pressing, is stored near the east end on tables and in bins. The mending room and small storage room are placed at the extremity of the building.

Parallel to the wards is the laboratory building, 135 feet in length and 22 feet in width, containing the chemical and bacteriological laboratories, pharmacy, and lecture room. The laboratory provides facilities for the instruction of a class of about 30 surgeons at a time. For this service, water, gas, and electricity—for both light and power—are furnished.

An administration building contains the general waiting rooms for visitors, with a telephone exchange and offices for the executive staff.

The grouping of the buildings is assigned as they would be at a field hospital. Walkways are provided between all buildings, differences of grade being taken up by inclines rather than by the use of steps. Where patients have to pass from one building to another, closed corridors are provided; otherwise the corridors connecting the pavilions are roofed, but open at the sides.

Adequate heating, ventilating, and sanitary conveniences were regarded as essential to the proper care of the patients. A pressure heating system, using steam pipe coils, has been installed and a minimum temperature of 60° maintained during the severe winter weather. A

separate steam line supplies the requirements of the laundry, kitchen, and sterilizing equipment. The plumbing is that of a permanent hospital, but with the suppression of all elaboration. Hot water is supplied at central points in various buildings by steam coil tanks, so placed that one tank supplies a group of three or four buildings, the length of runs thereby being much reduced. The buildings are lighted by electricity, exposed wiring being used throughout. The fixtures, except in the wards and operating buildings, are merely bulbs with tin reflectors.

Through the cooperation of the architect, the builder, and the contractor, the 15 barracks and huts, together with complete mechanical equipment, were erected in the extraordinarily short period of six weeks.

STAFF OF WAR DEMONSTRATION HOSPITAL

The staff of the Hospital consists of surgeons now assigned by the Surgeon General of the Army for instructional purposes, of French military surgeons lent by the French Sanitary Service, and of bacteriologists and chemists in part assigned by the Surgeon General. Medical officers of the Army and Navy are sent regularly for the course of instruction, which ordinarily covers a period of two weeks per class. Two

classes are therefore conducted each month. The medical officers and others (e. g. chemists and bacteriologists) are taught the principles of the method and are required to cover every one of its essential points by actual personal operation. They learn to prepare and to titrate, or control, the Dakin solution in the chemical laboratory; to make the microscopical examinations in the bacteriological laboratory; and to prepare the wounds and apply the treatment in the operating room and at the bedside.

INSTRUCTION AT WAR DEMONSTRATION HOSPITAL

Instruction at the War Demonstration Hospital has been given during the year to medical officers of the Army and Navy, to enlisted men of the Army and Navy, to civil surgeons, and to female nurses of the Red Cross and of civil hospitals. For the most part instruction has been given to men in classes conducted in the laboratories, in the wards, and in the operating room; and by lectures with lantern slides and moving pictures. The class work has been arranged in the following manner:

Regular Class. Men assigned to this course have been instructed in the clinical methods and proper manner of preparing and applying various antiseptics used in the treatment of infected

wounds. This course extends over a period of two weeks. Twelve courses have been given.

Special Instruction. At various times special instruction has been given to individual medical officers, doctors, nurses, and enlisted men; and special demonstrations have been arranged for groups of medical officers, doctors, and nurses.

Following is a detailed report of the number of persons receiving instruction:

Regular Class

Medical Officers of the Army.....	117
Medical Officers of the Navy.....	10
Civilians.....	10
<hr/>	
Total.....	137

Special Instruction

Medical Officers of the Army.....	5
Medical Officers of the Navy.....	1
Enlisted Men of the Army.....	5
Enlisted Men of the Navy.....	10
Female Nurses.....	12
<hr/>	
Total.....	33
TOTAL RECEIVING INSTRUCTION.....	170

In addition to the above, special demonstrations were given to two groups of surgeons of base hospitals, to one surgical class attending another school of instruction in New York City,

to one group of civilian surgeons, and to nine groups of nurses of base hospitals: a total of 13. Eighteen lectures and demonstrations were given by members of the staff at various institutions and before various medical societies.

During the year, 106 patients suffering from a wide variety of infections have been treated in the War Demonstration Hospital. The results of the treatment may be briefly stated as follows: discharged cured, 42; discharged improved, 19; still under treatment, 39; discharged unimproved, two; died, four.

In the treatment of these cases the four principles of treating infected wounds have been followed: first, mechanical cleansing, or surgical step; second, sterilization by antiseptic; third, bacteriological control and control of wound healing; fourth, closure.

Empyema, or pus within the pleural cavity, following pneumonia, has been an important problem of the military camps during the past winter and spring. As a considerable number of cases of pneumonia in soldiers and sailors were admitted to the Hospital of the Rockefeller Institute, a number of cases of empyema developed among them. These cases were transferred to the War Demonstration Hospital for operation and treatment. Nine cases, in all, were transferred. Of this number two patients

have died and seven are recovering and will, it is expected, be returned to duty. The results are therefore good. Empyema, especially of the streptococcic form in which it has principally prevailed among our troops, is a serious condition. The treatment for this condition, developed in the War Demonstration Hospital, has been the subject of special study by the Surgeon General and has received application in camp base hospitals.

RESEARCH AT WAR DEMONSTRATION HOSPITAL

The bacteriological and chemical laboratories of the Hospital have been engaged not only in the instruction of medical officers and others, but also in the investigation of certain problems of importance. These problems bear on the surgical treatment of wounds in various aspects. They relate to the action of antiseptic drugs other than sodium hypochlorite, to improved methods of applying the antiseptic to the wounds, to the elucidation of the principles of the action of the antiseptics, and to particular subjects assigned by the Surgeon General in connection with recommendations and suggestions made to him from various sources.

The hygienic care of soldiers in camp and the medical care of patients in hospitals rest far more

than the public imagines upon the sciences of bacteriology and chemistry. Bacteriology, especially, is often invoked to protect a company, regiment, or larger unit, from the dangers of a severe disease or the disadvantages of a general quarantine. Thus, if a case of diphtheria appears, any other infected men are quickly detected and removed on the basis of a bacteriological test; the same is true with respect to epidemic meningitis and some other diseases. Once in the hospital, the sick soldier's progress can often be measured best by the bacteriological and chemical tests carried out in the laboratory, and in every case the results of such examinations are of the greatest assistance to the clinician in charge of the patients.

AVAILABLE LABORATORY WORKERS FOR ARMY AND NAVY

The rise of bacteriology and clinical chemistry is comparatively recent. Hardly 20 years have elapsed since bacteriologists and chemists were first recognized as valuable adjuncts to the clinical staff of the hospital. It is a far shorter period since they have been regarded as essential to the medical organization for the care of the sick.

The fact was early recognized that the Sur-

geons General would make heavy demands upon the personnel of the bacteriological and clinical chemical laboratories of the country. It was conceived that probably the existing highly trained personnel would prove inadequate to meet the needs. On the other hand, it was believed that the recent general addition of bacteriology and its handmaiden, immunology (serology), to the medical curriculum, and the corresponding improvement in the teaching of chemistry in medical schools, as well as the creation of many diagnostic laboratories in hospitals, would provide a large number of partially trained laboratory workers who could readily and quickly be prepared to carry out, either alone or under supervision, diagnostic work in camp laboratories. Hence it was proposed to establish training courses in bacteriology, serology, and (later) medical chemistry for this class of students. The Surgeons General approved the project and have assigned medical officers and others to the Institute for instruction.

COURSES IN BACTERIOLOGY

The laboratories of the Institute give courses in bacteriology and serology to medical officers of the Army and Navy assigned by the Surgeon General of each service. The course in bac-

teriology and serology covers four weeks of intensive work and is repeated once a month. At the outset, 20 places were arranged in the laboratory; the number of places have been increased to 50. Eligible persons have been accepted from the Surgeons General of the Army and Navy; also a few civilians who purpose to join the Army or Navy have been accepted when space was available. Eligibility consists of previous training in laboratory methods with special reference to bacteriology and serology (or immunology). The various laboratories at the cantonments in this country, and the department laboratories and field laboratories in this country and in France, are now provided with men who have had the training given at the Rockefeller Institute. The chemical course is projected to begin early in the spring; each class will continue about four weeks.

Those attending the bacteriological course to December 31, 1917, were 103 officers, 26 men in the Navy, and 14 special civilians: a total of 143.

THERAPEUTIC SERUM

Reference has been made to the fact that the Rockefeller Institute originally contributed essentially to the perfection of the serums for the treatment of epidemic meningitis and pneu-

monia; it has also taken a leading part in the preparation of the antidyenteric serum and has recently worked out for the first time a protective and curative serum for gaseous gangrene (*B. welchii* infection).

Before the United States entered the war, the Institute—in order to meet the requests emanating from England, France, Belgium, Italy, and other countries—resumed the preparation of the antimeningococcic serum which it had discontinued several years earlier. The Rockefeller Foundation assumed the cost of the resumption of that manufacture, through which the serum could be supplied gratis to the Allies. Since epidemic meningitis exists in an endemic form widely in this country, its introduction into military camps was a foregone conclusion. With the United States on the brink of war with Germany, it was considered desirable greatly to extend the production of this serum and to increase also the output of the other serums with the perfection of which the Institute had, in the first place, been so closely identified. The Rockefeller Foundation made it possible to do this.

ERECTION OF STABLES

Commodious, modern stables were quickly built at the Department of Animal Pathology at

Princeton, and a bacteriological unit was developed to control the serum production. The main effort was directed towards quantity production of antimeningococcic and antipneumococcic serums. A small number of horses has been given over to the preparation of the antidysenteric and antigaseous gangrene serums. Several months necessarily elapsed before any considerable serum production was possible. At the present time the output is satisfactory and the quality of the products superior.

PRODUCTION OF SERUM

The curative serums which the Rockefeller Institute is producing for the Army and Navy of the United States, and which incidentally are being supplied for special purposes to civilian communities and to our Allies, are: the antimeningococcic serum for the treatment of epidemic meningitis, the antipneumococcic serum for the treatment of lobar pneumonia Type I infection, the antidysenteric serum for the treatment of bacillary dysentery, and the antigaseous gangrene serum for the prevention and treatment of *B. welchii* infection. All these serums are derived from horses. Only a small number of the horses are kept in the animal house in New York; the preparation of the serum is carried on

chiefly at the Department of Animal Pathology at Princeton, New Jersey. The quantities of the several serums produced during the year are: 532.52 litres, or 26,626 bottles, of antimeningococcic; 22.36 litres, or 1,118 bottles, of antidysenteric; 280.00 litres of antipneumococcic; and 75.00 litres of *B. welchii* antitoxin. The last two are not bottled especially, but are supplied in large containers.

ANTIGASEOUS GANGRENE SERUM

Reference has already been made to the occurrence of gaseous gangrene as a serious form of wound infection. Perhaps no bacteriological war subject has been so widely studied as that of gas bacillus infection, because of the severity of its effects in infected wounds. All the belligerent countries have assigned some of their best men to an investigation of that condition.

Fortunately, Major Carrol G. Bull of the Rockefeller Institute was able to establish the essential point leading to the solution of the problem. He discovered the toxin which the bacillus produces and through which it injures muscle and other tissues, thus enabling the gas bacilli (*B. welchii*) to multiply and disorganize the tissues. The next step was the preparation of the antidote, or antigaseous gangrene serum.

Dr. Bull has been in England and France for several months demonstrating the properties of the serum and the manner of its preparation. He has already convinced the Army medical officers of England and France, and those of the United States on active service, of the curative, and particularly of the protective, powers of the serum.

ANTITETANIC SERUM

It is proposed that, as far as practicable, every severely wounded man shall receive a prophylactic or protective injection of the serum. As a similar protective injection of the antitetanic serum is now given (through which tetanus, very frequent in the first months of the war, has now been practically abolished), it was soon found that both antisera could be produced in the same horse. One injection therefore sufficed for protection against both infections and, besides this, the number of horses required to produce the sera is reduced by one-half.

Major Bull will return to this country to instruct manufacturers of biological products in the preparation of the combined serum, and to investigate further certain other problems in connection with gangrenous wound infection.

ANTIDYSENTERIC SERUM AND VACCINATION

Fortunately, dysentery has not been very prevalent among our troops. Occasional cases do, however, occur and to combat these cases it is desirable that antidysenteric serum be available. For that reason a small quantity is being prepared, as there are no reliable commercial sources of the serum and the Institute is closely identified with its initial preparation. A method of vaccination against bacillary dysentery is being worked out at the Institute. Should it ever become necessary, vaccination against dysentery could be conducted as it is now conducted against typhoid fever.

TREATMENT OF PNEUMONIA

One of the most serious menaces to the health of our troops has been pneumonia. The serum developed in the Rockefeller Hospital for treatment of one of the varieties of this disease, that caused by Type I pneumococci, has been demonstrated to be most efficacious, and every effort is being made to cooperate with the Army in the proper employment of this serum in suitable cases.

Soldiers suffering from pneumonia are being admitted to the Hospital for treatment to as

great an extent as facilities permit. Medical officers are sent to the Rockefeller Hospital, where they are taught the methods of pneumonia diagnosis and treatment perfected there. They live in the Hospital as interns and remain for periods of from six weeks to several months. The twelve officers who have thus far been trained are now in charge of pneumonia patients at base hospitals in this country and abroad.

VACCINATION AGAINST PNEUMONIA

Preliminary studies concerning the efficacy of prophylactic vaccination against pneumonia are being carried on under the direction of Dr. Cole.

Experimental studies indicate that such vaccination may be effective against infection with pneumococci, Types I, II, and III, and practical experience with antipneumococcus vaccine among the miners in South Africa has already given indication of its practical value. The purpose of the studies that are being made is to bring sufficient evidence in support of the method to justify its employment in the Army.

EPIDEMIC MENINGITIS

Meningococcus carriers—healthy men in the Army and Navy who have acquired the menin-

gococcus in their nasal secretions and continue to harbor it there—are a source of danger to their associates. The Institute has endeavored to assist both the Army and Navy in dealing with the problem of these unfortunate men who must be kept isolated. Improved methods for treating them and freeing them from meningococci have been sought. The results on the whole have been quite good. Up to the present time ten persistent chronic carriers from the Army have been sent to the Hospital, all of whom have been discharged free from meningococci.

Meningitis was quite prevalent in certain camps during the past winter. The antimeningococcic serum produced at the Institute was supplied in large quantities to the Surgeon General for distribution to the several camps.

In addition, studies on vaccination against epidemic meningitis were carried out on a large scale at Camp Funston by Lieut. Gates. The results of his investigation are now in the hands of the Surgeon General.

TREATMENT OF SYPHILIS

At the laboratories of the Institute a new drug for the treatment of syphilis has been perfected which it is hoped may supplant salvarsan, at least in this country. Before having the drug

prepared in large quantities, and before putting it out for general use, precise tests of its action and the best manner of its administration will be carried out at the Hospital. The action of the drug in human cases is very satisfactory, bearing out the high hopes for its usefulness based on the animal tests. It has been patented in this country, and patents have been applied for in many foreign countries. It is proposed to have it manufactured under license, so as to protect the public from exorbitant prices and in order to insure the quality of the product. In this connection it may be added that the Institute has assisted the Surgeon General in arriving at a proper standard of value of salvarsan, which is now being manufactured under Government license.

COMBATING HEMORRHAGE AND SHOCK

One of the most serious consequences of wounds received on the battlefield is hemorrhage. Hemorrhage is the basal cause of many cases of shock, which in turn is the cause of many deaths.

Studies begun before the war and pursued later, for the express purpose of combating hemorrhage, have provided two methods of relieving its effects. Both are now being em-

ployed on the Western front. One method is the storing of red corpuscles removed from healthy persons. These can be resuspended in a suitable fluid and injected into the blood vessels. Excellent results have been obtained in this way. The other method is the employment of a sterile solution of gum arabic to replace the volume of blood lost. This latter has proved an excellent method of reestablishing the blood pressure and thus tiding over a very dangerous period. The gum solution is far superior to salt solution, because the latter leaves the blood vessels very soon and fails to maintain the blood pressure until the normal mechanism is restored.

PRODUCTION OF ACETONE

Acetone is a solvent extensively employed in aircraft production. A large program of aircraft manufacture calls for immense quantities of acetone. The present sources of supply are inadequate. Other belligerent countries, notably Germany and England, have turned to bacterial action for their increased output of the solvent. Methods, said to be successful, have been devised in both Germany and England; they are protected by patents. The precise nature of the German method is not known. The Weitzman process is used in England.

This problem of perfecting a method of acetone production by bacterial action was very early put before the Rockefeller Institute. Apparently, the problem has now been solved by Dr. J. H. Northrup. He has secured from potatoes a bacterium which acts upon starch either in the pure state or in grain, with the formation of a high percentage of acetone. Secondary, or by-products, are always formed in these bacterial fermentations; in the Weitzman method the chief secondary product is said to be butyl alcohol, which at present has a limited commercial application only. Luckily, in the Northrup process, the by-product is ethyl (or ordinary alcohol), which just now is of high commercial value. A patent has been applied for in order to protect the method and to enable the Government to use it without the necessity of paying royalty.

SURGICAL INVESTIGATION AT THE FRONT

Arrangements have been made to set up a laboratory at St. Cloud, near Paris, where further studies may be made on the repair of wounds, on hemorrhage and shock due to surgical injury, on gunshot wounds of the abdomen, and such other problems as may arise. The work there will be under the personal direction

of Dr. Carrel. Arrangements have also been made for one or more small laboratories in connection with field ambulances located near the front lines. The reason for multiplying the small field laboratories arises from the fact that a given sector, served by such an ambulance with its laboratory, may be quiet for a time, while in another sector, also served in this manner, active fighting is going on. It is possible to transfer laboratory personnel from one to the other—from the quiet to the active sector—and in that way forward the studies which the establishment of the field ambulances was designed to accomplish.

THE ROCKEFELLER FOUNDATION

Report of the Treasurer

To the President of The Rockefeller Foundation:

Sir:—

I have the honor to submit herewith my report of the financial operations of The Rockefeller Foundation and its subsidiary organizations for the period January 1, 1917, to December 31, 1917.

Respectfully yours,

L. G. MYERS,

Treasurer.

TREASURER'S REPORT

Income and other funds available for appropriation during the year, amounting to \$17,678,851.65, were as follows:

Income from principal funds (not including special funds) and from invested income and reserve	\$7,153,851.65
Principal funds made available for appropriation, including \$25,000.00 of the gift from the Estate of Laura S. Rockefeller	5,025,000.00
Gift from Mr. John D. Rockefeller	5,500,000.00
Total	<u>\$17,678,851.65</u>

The undisbursed balance carried over from 1916, after adding sundry refunds, was \$5,407,282.82, which, added to the above figure, made a total of \$23,086,134.47 available for disbursement. Of this sum \$11,457,086.36 was disbursed, leaving a balance of \$11,629,048.11, which should be divided as follows:

Balance payable on appropriations made in 1917 and prior years.	\$4,133,973.86
Amount available for appropriation —not taking into account pledges due in 1918, referred to below	7,495,074.25
Total	<u>\$11,629,048.11</u>

The appropriations that become effective in 1918 amount to \$6,223,737.00. If this sum be considered a present liability instead of a charge against 1918 income, the amount available for appropriation is reduced to \$1,271,337.25.

The amounts payable on appropriations above specified do not include appropriations which become effective in 1919 and subsequent years, amounting to \$3,363,565.00.

Principal funds, including reserve and special funds, increased during the year from \$102,034,447.79 to \$122,220,801.85, a difference of \$20,186,354.06, which is accounted for as follows:

Mr. Rockefeller's gift of 29,718 shares Standard Oil Company (Indiana) capital stock—Market price on date of receipt, \$867.00 per share	\$25,765,506.00
Mr. Rockefeller's gift of 10 shares American Ship Building Company common stock.....	350.00
Gross Increase	\$25,765,856.00
Deduct principal funds made available for appropriation	\$5,025,000.00
Net loss on securities sold, redeemed and exchanged.....	554,501.94
	<u>5,579,501.94</u>
Net Increase.....	<u><u>\$20,186,354.06</u></u>

In addition to the above, the amount expended for lands, buildings and equipment, increased during the year from \$630,959.37 to \$812,704.92, a difference of \$181,745.55. This sum is included in payments on account of appropriations and is shown in detail in Exhibit O.

The financial condition and operations are set forth in the following exhibits:

Balance Sheet.....	Exhibit A
Statements of Receipts and Disbursements of Income.....	Exhibit B
Foundation's Appropriations:	
War Work.....	Exhibit C
Infantile Paralysis.....	Exhibit D
Mental Hygiene.....	Exhibit E
Rockefeller Institute for Medical Research.....	Exhibit F
School of Hygiene and Public Health	Exhibit G
Founder's Designations.....	Exhibit H
Miscellaneous.....	Exhibit I

International Health Board Appropriations	Exhibit J
China Medical Board Appropriations ..	Exhibit K
Summary of Appropriations and Payments	Exhibit L
Additional Appropriations for Future Years	Exhibit M
Statements of Principal Funds	Exhibit N
Land, Buildings and Equipment Funds ..	Exhibit O
Transactions Relating to Invested Funds ..	Exhibit P
Schedule of Securities Belonging to General Funds	Exhibit Q
Schedule of Securities Belonging to Special Funds	Exhibit R

EXHIBIT A

BALANCE SHEET, DECEMBER 31, 1917

ASSETS

I. INVESTMENTS:

General Schedule (See Exhibit Q).....	\$126,283,791.51	
Less amount of income investments (see below).....	4,149,289.66	
		\$122,134,501.85
Special (See Exhibit R).....		86,300.00
		<u>\$122,220,801.85</u>

II. LAND, BUILDINGS, AND EQUIPMENT (Exhibit O).....

\$812,704.92

III. INCOME ACCOUNTS:

Income invested temporarily (Exhibit B).....	\$4,149,289.66
Funds in the hands of agents, to be accounted for, and sundry accounts receivable....	812,543.23
Moneys loaned.....	9,675,000.00
	<u>\$14,636,832.89</u>

Deduct Offsetting Liabilities:

Bank loans and overdraft discharged January 2 and 3, 1918).....	\$2,941,119.13	
Accounts payable	36,779.30	
		2,977,898.43
		<u>\$11,658,934.46</u>

TOTAL.....

\$134,692,441.23

EXHIBIT A

BALANCE SHEET, DECEMBER 31, 1917

FUNDS AND OBLIGATIONS

I. FUNDS:

General Fund (Exhibit N)	\$120,765,856.00	
Estate Laura S. Rockefeller Fund (Exhibit N)	152,733.00	
Reserve Fund (Exhibit N)	1,215,912.85	
		\$122,134,501.85
Special Funds (Exhibit N)		
Gift of John D. Rockefeller	\$37,000.00	
Gift of Laura S. Rockefeller	49,300.00	
		86,300.00
		<u>\$122,220,801.85</u>

II. LAND, BUILDINGS, AND EQUIPMENT FUND:

Appropriations from income (Exhibit O)		\$812,704.92
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III. INCOME ACCOUNTS:

Joint Account Belgian Children in Switzerland (Exhibit B)		\$1,847.28
Estate Laura S. Rockefeller Fund:		
Unappropriated income		28,039.07
General Fund:		
¹ Balance payable on appro- priations	\$4,133,973.86	
¹ Unappropriated income	7,495,074.25	
		11,629,048.11
		<u>\$11,658,934.46</u>

TOTAL	<u><u>\$134,692,441.23</u></u>
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¹ It should be noted that these figures do not take into account appropriations and pledges payable in 1918 amounting to \$6,223,737.00. If allowance is made for this sum, unappropriated income will amount to but \$1,271,337.25. Neither are appropriations and pledges, amounting to \$3,363,565.00, which become effective in 1919 and subsequent years, included in the balance sheet. Both of these liabilities are, for the purposes of this report, considered as charges against the income for the year in which the appropriations become payable.

EXHIBIT B

STATEMENTS OF RECEIPTS AND DISBURSEMENTS OF INCOME
AND OF OTHER FUNDS AVAILABLE FOR APPROPRIATION

GENERAL FUNDS

RECEIPTS

Balance January 1, 1917.....	\$5,390,161.94	
Sundry refunds of amounts dis- bursed in previous years.....	17,120.88	\$5,407,282.82
Income from principal funds and funds temporarily invested....	\$7,153,851.65	
Gift from Mr. John D. Rockefeller	5,500,000.00	
Principal Funds made available for appropriation by action of the Board:		
General Fund	\$5,000,000.00	
Laura S. Rockefeller Fund.....	25,000.00	
	<u>5,025,000.00</u>	17,678,851.65
Total amount available.....		<u>\$23,086,134.47</u>

DISBURSEMENTS

INTERNATIONAL HEALTH BOARD (Exhibit J)		
Hookworm, Malaria, and Yellow Fever work.....	\$431,992.24	
Tuberculosis work in France ...	38,481.37	
Medical Education.....	8,621.17	
Miscellaneous.....	78,734.40	\$557,829.18
CHINA MEDICAL BOARD (Exhibit K)		
Missionary Societies—Hospi- tals.....	\$48,968.75	
Fellowships and Scholarships..	44,515.39	
Medical Schools		
Unaffiliated.....	107,079.10	
Affiliated.....	263,989.26	
Miscellaneous.....	36,869.22	501,421.72
WAR WORK (Exhibit C)		
Well-being of Soldiers, Sailors, and Prisoners-of-war	\$1,839,350.84	
Medical work.....	228,634.72	
Humanitarian work.....	3,876,982.97	5,944,968.53
Carried Forward		<u>\$7,004,219.43</u> <u>\$23,086,134.47</u>

EXHIBIT B—*Continued*STATEMENTS OF RECEIPTS AND DISBURSEMENTS OF INCOME
AND OF OTHER FUNDS AVAILABLE FOR APPROPRIATION

GENERAL FUNDS

<i>Brought Forward</i>	\$7,004,219.43	\$23,086,134.47
CARE OF INFANTILE PARALYSIS CASES (Exhibit D)	44,737.49	
MENTAL HYGIENE (Exhibit E)	48,800.00	
KEFELLER INSTITUTE FOR MEDICAL RESEARCH (Exhibit F)	3,127,913.68	
SCHOOL OF HYGIENE AND PUBLIC HEALTH (Exhibit G)	31,319.70	
UNDER'S DESIGNATIONS (Exhibit H)	942,251.42	
CELLANEOUS (Exhibit I)	152,178.36	
MINISTRATION (Exhibit I)	105,532.28	
ST OF REGISTERING BONDS	134.00	

\$11,457,086.36

ANCE:	
curities (Exhibit Q)	\$4,149,289.66
neys loaned	9,645,113.65
unds in the hands of agents, to be accounted for, and sundry accounts receivable	812,543.23
	<hr/>
	\$14,606,946.54

DUCTIONS:	
ank loans and overdraft	\$2,941,119.13
ccounts payable	36,779.30
	<hr/>
	2,977,898.43
	<hr/>
	11,629,048.11

\$23,086,134.47

\$23,086,134.47

ANCE AS ABOVE IS APPORTIONED AS FOLLOWS:

ayable on appropriations and pledges for 1917 and previous years	\$4,133,973.86
mount available for appropriation	7,495,074.25
	<hr/>
	\$11,629,048.11

EXHIBIT B—*Continued*STATEMENTS OF RECEIPTS AND DISBURSEMENTS OF
INCOME AND OTHER FUNDS AVAILABLE
FOR APPROPRIATION

SPECIAL FUNDS

LAURA S. ROCKEFELLER FUNDS INCOME

Income collected during the year	<u>\$3,000.00</u>
Amount paid to the several societies designated by Mrs. Rockefeller	<u>\$3,000.00</u>

JOHN D. ROCKEFELLER FUND INCOME

Income collected during the year	<u>\$1,850.00</u>
Amount paid to the several societies designated by Mr. Rockefeller	<u>\$1,850.00</u>

ESTATE LAURA S. ROCKEFELLER FUND INCOME

Balance—January 1, 1917	\$16,687.65
Income collected during the year	<u>11,351.42</u>
Balance accounted for in moneys loaned ..	<u>\$28,039.07</u>

JOINT ACCOUNT BELGIAN CHILDREN IN SWITZER-
LAND

Balance—January 1, 1917	\$48,750.00
Payments during the year	<u>46,902.72</u>
Balance accounted for in moneys loaned ..	<u>\$1,847.28</u>

EXHIBIT C

1917 FOUNDATION APPROPRIATIONS,
UNPAID BALANCES OF APPROPRIATIONS MADE IN PREVIOUS YEARS,
AND PAYMENTS THEREON MADE IN 1917

WAR WORK

	PRIOR APPROPRIA- TIONS	1917 APPROPRIA- TIONS	1917 PAYMENTS
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WELL-BEING OF SOLDIERS,
SAILORS, AND PRISONERS-
OF-WARAmerican Library Asso-
tion.

(R.F. 2262) Under this appropriation \$25,000.00 was advanced to the Association for the purpose of inaugurating its financial campaign, with the understanding that it would be repaid by the Association from budget funds received from other sources. This advance has since been repaid

.....	\$25,000.00
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American Social Hygiene Association.

(R.F. 2251, 2256) For the support of workers serving under the direction of the Commission on Training Camp Activities...

.....	20,000.00	\$17,376.71
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(R.F. 2263) To provide lecture and exhibit material for use in American Army camps

.....	5,000.00	5,000.00
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Committee of Fourteen of New York City.

(R.F. 2257) For the support of workers serving under the direction of the Commission on Training Camp Activities...

.....	5,000.00	5,000.00
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Carried Forward.....	\$55,000.00	\$27,376.71
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EXHIBIT C—*Continued*

	PRIOR APPROPRIA- TIONS	1917 APPROPRIA- TIONS	1917 PAYMENTS
<i>Brought Forward</i>	\$55,000.00	\$27,376.71
WELL-BEING OF SOLDIERS, SAILORS, AND PRISONERS- OF-WAR (<i>Cont.</i>):			
Commission on Training Camp Activities. (R.F. 2265) Training Camp Auxiliary Fund Committee. Toward the budget for the year beginning Sep- tember 1, 1917	25,000.00	25,000.00
Jewish War Relief and Welfare Work Com- mittee. (R.F. 2291) For wel- fare work during 1918	100,000.00	100,000.00
Playground and Recrea- tion Association of America. (R.F. 2250) For the support of workers serving under the di- rection of the Com- mission on Training Camp Activities	20,000.00	20,000.00
(R.F. 2266, 2267) For administration ex- penses	200,000.00	125,000.00
Young Men's Christian Association. International Com- mittee. (R.F. 2179, 2195) For the establishment and maintenance of recreation centers in connection with the military forces on the Mexican border. \$20,000.00	20,000.00
(R.F. 2232) For work in prisoners - of - war camps and in training camps abroad	300,000.00	225,000.00
(R.F. 2233) For work in camps of the Am- erican Army and Navy	200,000.00	200,000.00
<i>Carried Forward</i>	\$20,000.00	\$900,000.00	\$742,376.71

EXHIBIT C—Continued

	PRIOR APPROPRIA- TIONS	1917 APPROPRIA- TIONS	1917 PAYMENTS
<i>Brought Forward</i>	\$20,000.00	\$900,000.00	\$742,376.71
WELL-BEING OF SOLDIERS, SAILORS, AND PRISONERS- OF-WAR (<i>Cont.</i>):			
Young Men's Christian Association (<i>Cont.</i>):			
National War Work Council.			
(R.F. 2248) For car- rying on sex educa- tion work . . . . .	.....	25,000.00	25,000.00
(R.F. 2268) Under this appropriation \$1,500,000.00 was advanced to the Council toward its general budget for the period October 1, 1917 to July 1, 1918, with the understand- ing that it would be repaid by the Coun- cil before December 31, 1917, from bud- get funds received from other sources. This advance has since been repaid . . . . .	.....	1,500,000.00	.....
(R.F. 2269) Toward its general budget for the period October 1, 1917 to July 1, 1918 . . . . .	.....	1,000,000.00	1,000,000.00
(R.F. 2271) For the purchase of testa- ments for distribu- tion to American sol- diers and sailors . . . . .	.....	25,000.00 ¹	25,000.00
Young Women's Chris- tian Association.			
(R. F. 2261, 2270) For work in connection with the American Army training camps . . . . .	.....	300,000.00	46,974.13
<i>Carried Forward</i>	\$20,000.00	\$3,750,000.00	\$1,839,350.84

¹ This appropriation was paid from the principal of the gift from the Estate of Laura S. Rockefeller.

EXHIBIT C—*Continued*

	PRIOR APPROPRIA- TIONS	1917 APPROPRIA- TIONS	1917 PAYMENTS
<i>Brought Forward</i>	\$20,000.00	\$3,750,000.00	\$1,839,350.84
MEDICAL WORK			
National Committee for Mental Hygiene.			
(R.F. 2234) To pro- vide buildings for a Naval Psychiatric Unit . . . . .	.....	15,000.00	.....
(R. F. 2235) For ex- penses incurred in connection with Dr. Salmon's visit to Europe . . . . .	.....	2,500.00	1,798.40
Rockefeller Institute for Medical Research.			
(R. F. 2142) For med- ical research and supplies in Eu- rope	25,000.00	.....	1,836.32
(R.F. 2225, 2246) For hospital under con- trol of Dr. Carrel, for teaching mili- tary and other sur- geons new methods of surgical treatment of infected wounds. .	.....	300,000.00	200,000.00
(R.F. 2228) For war research and relief during the year 1917	.....	25,000.00	.....
(R.F. 2229) For ad- ditional equipment, assistance and ma- terial at the Prince- ton Farm for the pre- paration of serums for war relief work. .	.....	25,000.00	.....
(R.F. 2230) For ad- ditional equipment for teaching military and naval surgeons in preparation for war relief . . . . .	.....	10,000.00	.....
Yale University.			
(R.F. 2243) For creat- ing a mobile hospital unit . . . . .	.....	25,000.00	25,000.00
<i>Carried Forward</i>	\$45,000.00	\$4,152,500.00	\$2,067,985.56

EXHIBIT C—*Continued*

	PRIOR APPROPRIA- TIONS	1917 APPROPRIA- TIONS	1917 PAYMENTS
<i>Brought Forward</i>	\$45,000.00	\$4,152,500.00	\$2,067,985.56
HUMANITARIAN WORK			
American Red Cross.			
(R.F. 2247) For the war fund of the American Red Cross ..	.....	5,000,000.00 ¹	3,500,000.00
(R.F. 2254) Special Red Cross dividend declared by the American Ship Building Company.....	.....	14,972.00	14,972.00
(R.F. 2255) Special Red Cross dividend declared by the National Lead Company.....	.....	29,400.00	29,400.00
Armenia and Syria.			
(R.F. 2215) American Committee for Armenian and Syrian Relief.....	.....	50,000.00	50,000.00
Belgium.			
(R.F. 2192) Stipends for Belgian professors in England.....	10,000.00	.....	7,482.43
(R.F. 2231, 2236) For furnishing a supplementary ration to Belgian children ...	.....	150,000.00	100,000.00
France.			
(R.F. 2211, 2294) Tuberculosis work in France—For expenses incurred in connection with Dr. Herman M. Biggs' visit to France ...	.....	17,111.11	10,611.11
Poland, Serbia, Montenegro and Albania.			
(R.F. 2165) For relief work.....	974,468.68	.....	61,250.05
<i>Carried Forward</i>	\$1,029,468.68	\$9,413,983.11	\$5,841,701.15

¹ A portion of the principal fund of the Foundation was made available for this appropriation.

EXHIBIT C—*Continued*

	PRIOR APPROPRIA- TIONS	1917 APPROPRIA- TIONS	1917 PAYMENTS
<i>Brought Forward</i>	\$1,029,468.68	\$9,413,983.11	\$5,841,701.15
HUMANITARIAN WORK			
(Cont.):			
Prisoners-of-war Welfare Work.			
(R.F. 2193, 2293) Administration.....	299,622.00	1,195.18	25,817.18
(R.F. 2194) Supply Division.....	200,000.00	.....	.....
Turkey.			
(R.F. 2192A, 2292) For the relief of the non-Moslem population within the Turkish Empire.....	100,000.00	5,504.07	30,504.07
General Relief Work.			
(R.F. 2157) To be expended at the discretion of the Director of the War Relief Commission.....	18,623.00	.....	3,203.74
Dr. Wallace Buttrick's Mission to Europe.			
(R.F. 2249) Salaries and expenses.....	.....	18,000.00	10,233.52
War Relief Commission.			
(R.F. 2209) Administration 1916.....	5,181.50	.....	3,075.94
(R.F. 2216) Administration 1917.....	.....	50,000.00	30,432.93
GROSS TOTALS.	\$1,652,895.18	\$9,488,682.36	\$5,944,968.53
Unexpended balances of appropriations allowed to lapse.			
R.F. 2165..	\$810,000.00		
2192A	75,000.00		
2193..	275,000.00		
2194..	200,000.00		
2142..	23,163.68		
2209..	2,105.56		
	1,385,269.24	.....	.....
R.F. 2211..	\$6,500.00		
2235..	701.60		
2236..	50,000.00		
2249..	7,766.48		
2262..	25,000.00		
2268..	1,500,000.00		
	.....	1,589,968.08	.....
NET TOTALS..	\$267,625.94	\$7,898,714.28	\$5,944,968.53

EXHIBIT D

INFANTILE PARALYSIS

	PRIOR APPROPRIA- TIONS	1917 APPROPRIA- TIONS	1917 PAYMENTS
After Care of Infantile Paralysis Cases.			
(R.F. 2181, 2227) For expenses involved in organization in New York City	\$14,693.72	\$1,800.00	\$16,493.72
(R.F. 2253) For administrative expenses		15,000.00	4,536.22
Brooklyn Bureau of Charities.			
(R.F. 2189) For the after care of Infantile Paralysis cases. Total pledge of \$12,000.00 extending over a period of six months ending March 31, 1917. (Installment due 1917)		6,000.00	6,000.00
New York City Department of Health.			
(R.F. 2176) For use in controlling the epidemic of Infantile Paralysis	27,508.58		1,620.12
Rockefeller Institute for Medical Research.			
(R.F. 2184) For publication of pamphlet on Poliomyelitis	1,438.28		87.43
State Charities Aid Association.			
(R.F. 2187, 2224, 2226) For expenses incurred through the Association's cooperation with the State Department of Health in providing for the after care of Infantile Paralysis cases..	2,000.00	14,000.00	16,000.00
	<u>\$45,640.58</u>		
Unexpended balances of appropriations allowed to lapse.			
(R.F. 2176)	\$25,888.46		
(R.F. 2184)	1,350.85		
	<u>27,239.31</u>		
TOTALS	<u>\$18,401.27</u>	<u>\$36,800.00</u>	<u>\$44,737.49</u>

EXHIBIT E

MENTAL HYGIENE

	PRIOR APPROPRIA- TIONS	1917 APPROPRIA- TIONS	1917 PAYMENTS
National Committee for Men- tal Hygiene.			
(R.F. 2107) For a survey under the direction of the committee of the care and treatment of insane in various states.....	\$2,800.00	.....	\$2,800.00
(R.F. 2206) For adminis- tration expenses .....	.....	\$7,000.00	7,000.00
(R.F. 2168) To defray for one year the cost of a pro- posed psychiatric depart- ment for the examination of prisoners at Sing Sing Prison.....	5,000.00	.....	5,000.00
(R.F. 2258) For the sup- port of the Psychiatric Clin- ic at Sing Sing Prison for the year ending July 31, 1918 .....	.....	10,000.00	10,000.00
(R.F. 2259) For the work of the committee in aiding state commissions on pro- vision for the mentally defective, during the year ending July 31, 1918.....	.....	23,500.00	15,000.00
(R.F. 2260) For studies in the psychopathology of crime.....	.....	15,000.00	9,000.00
TOTALS.....	<u>\$7,800.00</u>	<u>\$55,500.00</u>	<u>\$48,800.00</u>

EXHIBIT F

ROCKEFELLER INSTITUTE FOR MEDICAL RESEARCH

FOR ENDOWMENT AND CURRENT EXPENSES

	PRIOR APPROPRIA- TIONS	1917 APPROPRIA- TIONS	1917 PAYMENTS
(R.F. 2135, 2212, 2213, 2299) For its corpo- rate purposes.....	\$1,000,000.00	\$107,156.08	\$1,057,156.08
(R.F. 2172) For its cur- rent expenses.....	80,000.00	.....	70,757.60
(R.F. 2173) For altera- tion of buildings....	80,303.72	.....	.....
Carried Forward.....	\$1,160,303.72	\$107,156.08	\$1,127,913.68

EXHIBIT F—*Continued*

	PRIOR APPROPRIA- TIONS	1917 APPROPRIA- TIONS	1917 PAYMENTS
<i>Brought Forward</i> . . .	\$1,160,303.72	\$107,156.08	\$1,127,913.68
(R.F. 2244) For its permanent endow- ment . . . . .	.....	2,000,000.00	2,000,000.00
(R.F. 2245) For con- struction of coal pock- ets . . . . .	.....	30,000.00	.....
	<u>\$1,160,303.72</u>		
Unexpended balance of appropriation al- lowed to lapse. (R.F. 2172)	9,242.40	.....	.....
TOTALS	<u>\$1,151,061.32</u>	<u>\$2,137,156.08</u>	<u>\$3,127,913.68</u>

EXHIBIT G

SCHOOL OF HYGIENE AND PUBLIC HEALTH

	PRIOR APPROPRIA- TIONS	1917 APPROPRIA- TIONS	1917 PAYMENTS
Johns Hopkins Univer- sity. (R.F. 2170, 2223) For the establishment and maintenance of a school of hy- giene and public health	\$237,000.00	\$15,000.00	\$11,319.70
(R.F. 2242) For ad- ministration and equipment of the School of Hygiene and Public Health during the year 1917-18 . . . . .	.....	70,290.00	20,000.00
		<u>\$85,290.00</u>	
Unexpended balance of appropriation al- lowed to lapse. (R.F. 2223) . . . . .	.....	12,500.00	.....
TOTALS	<u>\$237,000.00</u>	<u>\$72,790.00</u>	<u>\$31,319.70</u>

EXHIBIT H

FOUNDER'S DESIGNATIONS

	1917	
	PAYMENTS	
Alta Social Settlement—Balance amounting to \$10,666-.68, due on designations towards budget and repair fund, for year ending September 1, 1917.....	\$7,927.30	
American Baptist Foreign Mission Society.....	150,000.00	
American Baptist Home Mission Society.....	75,000.00	
American Baptist Publication Society.....	12,116.37	
American Red Cross.....	5,000.00	
Baptist Missionary Convention of the State of New York—For expenses \$12,500.00.....	9,374.99	
Baptist State Mission Board of Pennsylvania.....	600.00	
Baptist Union of Western Canada.....	10,000.00	
Blue Ridge Association.....	500.00	
Boy Scouts of America—Balance due on designation of \$4,500.00 for the support of the work in greater New York.....	2,250.00	
Brooklyn Bureau of Charities.....	2,000.00	
Bureau of Municipal Research—Balance due on designation of \$3,750.00 for expenses of Training School for Public Service.....	2,500.00	
Children's Aid Society of New York.....	2,500.00	
Cleveland Baptist City Mission Society.....	5,000.00	
Foreign Mission Board of the Southern Baptist Convention.....	14,632.76	
Girls' Branch of the Public School Athletic League of the City of New York.....	300.00	
National League on Urban Conditions Among Negroes—For expenses.....	3,000.00	
New York Association for Improving the Condition of the Poor.....	6,000.00	
New York City Baptist Mission Society—For expenses \$23,000.00.....	17,250.00	
Philharmonic Society of New York.....	4,000.00	
Public Education Association of the City of New York.....	5,000.00	
Society for Italian Immigrants.....	500.00	
State Charities Aid Association.....	5,000.00	
United Hospital Fund of New York.....	5,000.00	
Whittier House.....	800.00	
Young Men's Christian Association:		
Cleveland, Ohio.....	2,000.00	
Tarrytown, N. Y.....	500.00	
University of Minnesota (Building Fund).....	25,000.00	
International Committee.....	51,250.00	
International Committee—Home Department.....	16,250.00	
State Executive Committee—New York State.....	1,000.00	
Young Women's Christian Association:		
National Board.....	500,000.00	
BALANCE SUBJECT TO MR. ROCKEFELLER'S DESIGNATIONS—January 1, 1917....	\$907,488.11	
Carried Forward.....	\$907,488.11	\$942,251.42

EXHIBIT H—Continued

1917

PAYMENTS

<i>Brought Forward</i>	\$907,488.11	\$942,251.42
Set aside for Mr. Rockefeller's designations during the year 1917	\$1,000,000.00	.....
Unexpended portion of amount set aside for designations during 1917 made available for the general purposes of the Foundation. (By a letter dated July 19, 1917, Mr. Rockefeller surrendered his right to designate the distribution of any part of the Foundation's income.)	965,236.69	34,763.31
TOTALS.....	\$942,251.42	\$942,251.42

EXHIBIT I

MISCELLANEOUS

	PRIOR APPROPRIA- TIONS	1917 APPROPRIA- TIONS	1917 PAYMENTS
American Academy in Rome. (R.F. 215) For general purposes, \$10,000.00 per year for ten years, beginning with 1914. (Installment due 1917)	\$10,000.00	\$10,000.00
American Social Hygiene Association. (R.F. 2188) For current expenses. Total pledge of \$20,000.00 extending over a period of two years, beginning with 1916. (Installment due 1917)	10,000.00	10,000.00
(R.F. 2264) For current expenses, 1916-1917	5,000.00	5,000.00
Bureau of Municipal Research. (R.F. 265) For constructive studies in Government of State of New York, \$10,000.00 per year for five years, beginning with 1915. (Installment due 1917)	10,000.00	10,000.00
<i>Carried Forward</i>	\$35,000.00	\$35,000.00

EXHIBIT I—*Continued*

	PRIOR APPROPRIA- TIONS	1917 APPROPRIA- TIONS	1917 PAYMENTS
<i>Brought Forward</i>.....	.....	\$35,000.00	\$35,000.00
Bureau of Municipal Re- search. (<i>Cont.</i>):			
(R.F. 2102) For its New York City work, \$15,- 000.00 per year for four years beginning with 1916. (Installment due 1917).....	.....	15,000.00	15,000.00
Committee on Scientific Re- search in Governmental Problems.			
(R.F. 2183) For cost of publication of scientific studies.....	\$12,000.00	.....	4,000.00
(R.F. 2196, 2214) For studies in governmental problems.....	2,000.00	3,500.00	5,500.00
Committee of Reference and Counsel of the Annual Foreign Mission Confer- ence of North America.			
(R.F. 228) For carrying out its program of co- operation and coordi- nation in foreign mis- sionary work of the principal American Mission Boards. Total pledge of \$425,000.00 ex- tending over a period of ten years, beginning with 1914. (Install- ment due 1917).....	.....	50,000.00	50,000.00
Investigation of Industrial Relations.			
(R.F. 2140) Administra- tion 1916.....	5,182.05	.....	.....
(R.F. 2205) Administra- tion 1917.....	.....	20,000.00	13,868.98
National Committee for the Prevention of Blind- ness.			
(R.F. 233) \$5,000.00 per year for five years be- ginning with 1914. (In- stallment due 1917)...	.....	5,000.00	5,000.00
<i>Carried Forward</i>	\$19,182.05	\$128,500.00	\$128,368.98

EXHIBIT I—Continued

	PRIOR APPROPRIA- TIONS	1917 APPROPRIA- TIONS	1917 PAYMENTS
<i>Brought Forward</i>	\$19,182.05	\$128,500.00	\$128,368.98
New York Association for Improving the Condi- tion of the Poor. (R.F. 239) For the pur- pose of providing pen- sions for dependent wid- ows with families. \$20,- 000.00 a year for ten years beginning with 1914. (Balance of In- stallment due 1916)...	15,000.00	.....	15,000.00
(Installment due 1917)...	.....	20,000.00	5,000.00
ASSET ACCOUNTS:			
(R.F. 2204) Books for the Library.....	.....	700.00	282.79
(R.F. 2203) Furniture and Fixtures.....	.....	2,000.00	1,907.07
(R.F. 2252) Grand Chen- ier Tract, Taxes and Expenses.....	.....	3,000.00	1,619.52
	<u>\$34,182.05</u>	<u>\$154,200.00</u>	
Unexpended balances of ap- propriations allowed to lapse.			
(R.F. 2140).....	5,182.05	.....	.....
(R.F. 2203) \$92.93			
(R.F. 2204) 417.21			
	.....	510.14	.....
TOTALS.....	<u>\$29,000.00</u>	<u>\$153,689.86</u>	<u>\$152,178.36</u>
ADMINISTRATION:			
(R.F. 2201, 2295, 2291A) Secretary's office.....	.....	\$97,353.72	\$91,950.73
(R.F. 2202, 2296, 2291A) Treasurer's office.....	.....	14,439.07	13,581.55
		<u>\$111,792.79</u>	
Unexpended balance of appro- priation allowed to lapse.			
(R.F. 2295).....	.....	90.61	.....
TOTALS.....	<u>.....</u>	<u>\$111,702.18</u>	<u>\$105,532.28</u>

EXHIBIT J

INTERNATIONAL HEALTH BOARD¹

	PRIOR APPROPRIA- TIONS	1917 APPROPRIA- TIONS	1917 PAYMENTS
HOOKWORM WORK:			
Southern States:			
Alabama:			
1917 .....	.....	\$3,650.00	\$164.98
Arkansas:			
1917 .....	.....	2,250.00	62.67
Georgia:			
1917 .....	.....	2,150.00	.....
Kentucky:			
1916	1,743.73	.....	1,267.45
1917 .....	.....	2,600.00	1,782.35
Louisiana:			
1916	1,131.16	.....	444.35
1917 .....	.....	3,750.00	881.64
Maryland:			
1917 .....	.....	1,500.00	4.60
Mississippi:			
1916	3,979.25	.....	2,291.48
1917 .....	.....	6,236.00	3,036.77
North Carolina:			
1916	207.01	.....	100.00
1917 .....	.....	7,336.25	600.00
South Carolina:			
1916	2,480.11	.....	1,552.22
1917 .....	.....	8,937.50	5,843.33
Tennessee:			
1916	2,752.37	.....	1,549.94
1917 .....	.....	15,500.00	4,627.33
Texas:			
1916	1,821.58	.....	899.75
1917 .....	.....	14,337.50	1,663.53
Virginia:			
1916	1,608.32	.....	1,270.39
1917 .....	.....	7,950.00	3,901.83
Central America:			
Costa Rica:			
1916	8,489.31	.....	3,819.29
1917 .....	.....	21,194.00	3,291.98
Guatemala:			
1916	6,528.07	.....	1,670.90
1917 .....	.....	12,280.00	7,596.34
Carried Forward	\$30,740.91	\$109,671.25	\$48,323.12

¹The Foundation provides for the cost of work carried on by the International Health Board by making to the Board one or more appropriations to cover its work for the year. From these large grants the Board then makes its own appropriations for specific objects.

EXHIBIT J—*Continued*

	PRIOR APPROPRIA- TIONS	1917 APPROPRIA- TIONS	1917 PAYMENTS
<i>Brought Forward</i>	\$30,740.91	\$109,671.25	\$48,323.12
HOOKWORM WORK (<i>Cont.</i>):			
Central America (<i>Cont.</i>):			
Nicaragua:			
1916	10,509.42	.....	3,160.30
1917 . . . . .	.....	21,560.00	10,894.37
Panama:			
1916	6,150.60	.....	3,664.37
1917 . . . . .	.....	20,210.00	14,650.40
Salvador:			
1916	7,865.66	.....	2,912.49
1917 . . . . .	.....	10,179.00	6,878.29
South America:			
Brazil:			
1916	1,933.73	.....	1,933.73
1917 . . . . .	.....	38,375.00	20,105.36
British Guiana:			
1916	10,633.19	.....	2,794.61
1917 . . . . .	.....	16,284.50	10,750.32
Dutch Guiana:			
1916	3,739.00	.....	2,461.46
1917 . . . . .	.....	11,399.00	9,293.04
British West Indies:			
Antigua:			
1916	3,767.64	.....	1,905.12
1917 . . . . .	.....	5,620.00	1,486.55
Cayman Islands—			
Survey:			
1917 . . . . .	.....	800.00	222.93
Grenada:			
1916	4,412.56	.....	1,896.50
1917 . . . . .	.....	6,470.00	3,906.18
St. Lucia:			
1916	1,771.58	.....	1,662.88
1917 . . . . .	.....	7,760.60	5,100.09
St. Vincent:			
1916	4,100.02	.....	1,416.69
1917 . . . . .	.....	7,807.60	4,029.93
Tobago—Survey:			
1917 . . . . .	.....	800.00	425.91
Trinidad:			
1916	13,173.25	.....	1,550.64
1917 . . . . .	.....	8,470.00	5,066.97
The East:			
Administration:			
1916	67.30	.....	67.30
1917 . . . . .	.....	300.00	299.70
<i>Carried Forward</i>	\$98,864.86	\$265,706.95	\$166,859.25

EXHIBIT J—*Continued*

	PRIOR APPROPRIA- TIONS	1917 APPROPRIA- TIONS	1917 PAYMENTS
<i>Brought Forward</i>	\$98,864.86	\$265,706.95	\$166,859.25
HOOKWORM WORK (<i>Cont.</i>):			
The East (<i>Cont.</i>):			
Ceylon:			
1916	7,433.61		2,122.02
1917		16,650.00	11,982.63
China—Hunan Prov- vince:			
1917		5,000.00	2,873.28
Egypt:			
1915	15,891.88		
Federated Malay States and Java—Hook- worm Commission:			
1916	14,503.12		11,474.81
1917		13,081.72	4,084.55
Fiji Islands:			
1917		5,532.36	1,984.79
Papua and Queensland —Survey:			
1917		2,000.00	73.87
Philippine Hospital Ship:			
1917		12,500.00	
Seychelles Islands:			
1917		5,312.80	3,688.32
Siam:			
1916	1,310.83		2.27
1917		5,000.00	1,648.86
Field expenses not covered by Bud- gets:			
Salaries and expenses of Field Staff:			
1916	5,065.39		2,321.14
Salaries of Field Staff:			
1917		150,000.00	132,295.45
Traveling expenses of Field Staff:			
1917		60,000.00	33,309.03
Traveling expenses of families of Field Staff:			
1917		2,000.00	1,699.03
<i>Carried Forward</i>	\$143,069.69	\$542,783.83	\$376,419.30

EXHIBIT J—Continued

	PRIOR APPROPRIA- TIONS	1917 APPROPRIA- TIONS	1917 PAYMENTS
<i>Brought Forward</i>	\$143,069.69	\$542,783.83	\$376,419.30
HOOKWORM WORK (<i>Cont.</i>):			
The East (<i>Cont.</i>):			
Field expenses not covered by Budgets. (<i>Cont.</i>):			
Drugs for conserving health of members of the Field Staff.		500.00	43.49
Purchase of automobiles for use of directors in training.		3,000.00	1,171.20
Field equipment and supplies.		3,000.00	2,464.68
Miscellaneous:			
Pamphlet on control of hookworm disease.		700.00	.....
Leaflet on hookworm disease.		700.00	591.19
Lecture charts on hookworm disease.		500.00	274.20
School chart on hookworm disease.		1,400.00	470.27
Conference of health officers of the Southern States.		2,500.00	2,073.40
Portable house and office, and losses incurred on account of earthquake in Salvador.		8,600.00	6,060.74
Motor boat for Dutch Guiana.		3,000.00	2,710.65
Investigation of sewage disposal			
1916.	335.61	.....	.....
1917.		10,000.00	.....
MALARIA WORK:			
Southern States:			
Arkansas:			
1917.		6,240.00	3,141.33
Mississippi:			
1916.	15,191.95	.....	7,077.47
1917.		41,170.00	25,914.02
<i>Carried Forward</i>	\$158,597.25	\$624,093.83	\$428,411.94

EXHIBIT J—*Continued*

	PRIOR APPROPRIA- TIONS	1917 APPROPRIA- TIONS	1917 PAYMENTS
<i>Brought Forward</i>	\$158,597.25	\$624,093.83	\$428,411.94
YELLOW FEVER WORK:			
Yellow Fever Commission:			
1916	6,004.16	.....	1,467.33
Yellow Fever Control:			
Guayaquil, Ecuador ..	.....	20,000.00	.....
East coast of Brazil ..	.....	5,000.00	1,609.42
Salaries of Yellow Fever Commission .....	.....	35,000.00	.....
Traveling expenses of Yellow Fever Commis- sion .....	.....	12,000.00	503.55
TUBERCULOSIS WORK IN FRANCE:			
Inauguration of work ..	.....	25,000.00	18,579.08
Central administration ..	.....	24,265.00	14,122.58
Medical division .....	.....	33,798.00	5,211.71
Educational division ..	.....	16,820.00	568.00
MEDICAL EDUCATION:			
Trip to South America of advisor in medical education .....	.....	7,400.00	5,618.79
Sao Paulo, Brazil, De- partment of Hygiene —Equipment .....	.....	10,000.00	179.59
University of Pennsyl- vania:			
1916	1,000.00	.....	600.94
1917 .....	.....	2,500.00	1,250.00
Chagas, Dr. Carlos P. Fellowship .....	.....	2,650.00	971.85
MISCELLANEOUS:			
Survey and Education:			
Administration 1917 ..	.....	18,420.00	13,854.57
Express, freight, and ex- change .....	.....	4,000.00	3,022.17
Income tax on non-resi- dent aliens .....	.....	3,500.00	.....
	\$165,601.41	\$844,446.83	\$495,971.52
ADMINISTRATION:			
Home Office	128.77	75,540.16	61,857.66
<i>Carried Forward</i>	\$165,730.18	\$919,986.99	\$557,829.18

EXHIBIT J—*Continued*

	PRIOR APPROPRIA- TIONS	1917 APPROPRIA- TIONS	1917 PAYMENTS
<i>Brought Forward</i>	\$165,730.18	\$919,986.99	\$557,829.18
Balance of funds appropriated by the Rockefeller Foundation for the Board's work during 1917 remaining unappropriated by the International Health Board on December 31, 1917.....	.....	31,163.99	.....
	<u>\$165,730.18</u>	<u>\$951,150.98</u>	
Unexpended balances of appropriations and unappropriated balance allowed to lapse	84,480.46	94,788.49	.....
TOTALS.....	<u>\$81,249.72</u>	<u>\$856,362.49</u>	<u>\$557,829.18</u>

EXHIBIT K

CHINA MEDICAL BOARD¹

	PRIOR APPROPRIA- TIONS	1917 APPROPRIA- TIONS	1917 PAYMENTS
MISSIONARY SOCIETIES—			
HOSPITALS:			
American Baptist Foreign Mission Society.			
(C.M. 276) Ningpo Hospital, for salaries of doctor and nurse, \$2,250.00 per year for five years, beginning with 1918.
(C.M. 277) Shaohsing Hospital, for support of foreign nurse, Chinese business manager and foreign doctor, \$2,475.00 per year for five years, beginning with 1918.
<i>Carried Forward</i>

¹The Foundation provides for the cost of work carried on by the China Medical Board by making to the Board one or more appropriations to cover its work for the year. From these large grants the Board then makes its own appropriations for specific objects.

EXHIBIT K—*Continued*

	PRIOR APPROPRIA- TIONS	1917 APPROPRIA- TIONS	1917 PAYMENTS
<i>Brought Forward</i>.....	.....	.....	.....
MISSIONARY SOCIETIES— HOSPITALS (<i>Cont.</i>):			
American Baptist For- eign Mission Soci- ety. (<i>Cont.</i>):			
(C.M. 278) Shaohsing Hospital, equipment and residences for Chinese staff, nurse, and physician	\$8,512.50	.....	.....
American Board of Com- missioners for For- eign Missions.			
(C.M. 211, 294) Teh- chow Hospital, for salary of two doctors, \$3,236.00 per year for five years, begin- ning with 1915. (Bal- ance due on previous installments)	5,418.00	.....	\$1,054.00
(Installment due 1917)	.....	\$3,236.00	263.50
(C.M. 297) Tehchow Hospital, employes salaries, \$3,951.00 per year for five years, beginning with 1916. (Balance of installment due 1916)	2,963.25	.....	2,172.75
(Installment due 1917)	.....	3,951.00	.....
(C.M. 2229) Tehchow Hospital, for support of a business man- ager, \$201.00 per year for five years, beginning with 1916. (Installments for 1916 and 1917) .....	.....	402.00	201.00
Board of Foreign Missions of the Methodist Epis- copal Church.			
(C.M. 283, 2176) Wuhu Hospital, for salary and allowance of doc- tor, \$900.00 per year for five years, begin- ning with 1916. (In- stallment due 1916).	825.00	.....	825.00
<i>Carried Forward</i>	\$17,718.75	\$7,589.00	\$4,516.25

EXHIBIT K—*Continued*

	PRIOR APPROPRIA- TIONS	1917 APPROPRIA- TIONS	1917 PAYMENTS
<i>Brought Forward</i>	\$17,718.75	\$7,589.00	\$4,516.25
MISSIONARY SOCIETIES— HOSPITALS (<i>Cont.</i>):			
Board of Foreign Missions of the Methodist Epis- copal Church. (<i>Cont.</i>): (Installment due 1917)		975.00	675.00
(C.M. 223, 2102) Pe- king, salary of two doctors; Changli, sal- ary of physician and foreign nurse; Taian- fu, salary of physi- cian and foreign nurse. \$11,800.00 a year for five years, beginning with 1916. (Installments due in previous years) .. \$21,200.00 Less por- tion of ap- propriation lapsed .. 18,800.00			
	2,400.00	.....	2,400.00
(Install- ment due 1917) ... \$11,800.00 Less por- tion of ap- propriation lapsed .. 9,400.00			
	.....	2,400.00	800.00
Board of Missions of the Methodist Episcopal Church, South.			
(C.M. 236, 2105) Soo- chow Hospital, for doctor's residence, outfit, traveling ex- penses, and medical allowance, \$3,500.00; for salary \$600.00 per year for five years, beginning with 1916. (Balance of install- ment due 1916)	3,000.00	.....	3,000.00
(Installment due 1917) .....	.....	600.00	.....
<i>Carried Forward</i>	\$23,118.75	\$11,564.00	\$11,391.25

EXHIBIT K—*Continued*

	PRIOR APPROPRIA- TIONS	1917 APPROPRIA- TIONS	1917 PAYMENTS
<i>Brought Forward</i>	\$23,118.75	\$11,564.00	\$11,391.25
MISSIONARY SOCIETIES— HOSPITALS (<i>Cont.</i>):			
Board of Missions of the Methodist Epis- copal Church, South and American Baptist Foreign Mission Soci- ety, jointly.			
(C.M. 2151) New Union Hospital at Huchow, for building and equipment.....	.....	20,000.00	.....
(C.M. 2152) Hospital at Huchow, for sup- port of a foreign physician, \$5,025.00 extending over a pe- riod of five years, beginning with 1918.	.....	.....	.....
(C.M. 2153) Hospital at Huchow, for sup- port of a foreign nurse, \$3,000.00 ex- tending over a per- iod of five years, be- ginning with 1918 ..	.....	.....	.....
(C.M. 2154) Hospital at Huchow, for sup- port of a Chinese physician, \$2,250.00 extending over a per- iod of five years, be- ginning with 1918 ..	.....	.....	.....
Board of Foreign Mis- sions of the Presby- terian Church in the U. S. A.			
(C.M. 284) Chefoo Hospital, for salary and allowance of doctor and nurse, \$2,- 625.00 per year for five years, beginning with 1917. (Install- ment due 1917) ....	.....	2,625.00	825.00
(C.M. 2242) Chefoo Hospital, for the in- stallation of an elec- tric lighting system.	.....	900.00	900.00
<i>Carried Forward</i>	\$23,118.75	\$35,089.00	\$13,116.25

EXHIBIT K—*Continued*

	PRIOR APPROPRIA- TIONS	1917 APPROPRIA- TIONS	1917 PAYMENTS
<i>Brought Forward</i>	\$23,118.75	\$35,089.00	\$13,116.25
MISSIONARY SOCIETIES—			
HOSPITALS (<i>Cont.</i>):			
Board of Foreign Mis-			
sions of the Presby-			
terian Church in the			
U. S. A. (<i>Cont.</i>):			
(C.M. 285) Hwaiyuen			
Hospital, for salary			
and allowance of phy-			
sician and nurse, and			
running expenses, \$3,-			
375.00 per year for			
five years, beginning			
with 1918.....	.....	.....	.....
(C.M. 286) Hwaiyuen			
Hospital, for resi-			
dence of doctor,			
and equipment	5,250.00	.....	.....
(C.M. 287) Paotingfu			
Hospital, for equip-			
ment and repairs...	117.50	.....	117.50
(C.M. 214, 295) Pa-			
otingfu, for salaries			
of doctor and two			
nurses and residence;			
Shuntehfu, for sal-			
aries of doctor and			
two nurses and resi-			
dence. Salaries, \$9,-			
200.00 per year for			
five years, beginning			
with 1916. (Balance			
of installment due			
1916).....	4,400.00	.....	.....
(Installment due			
1917).....	.....	9,200.00	.....
(C.M. 2189) Paoting-			
fu Hospital, for sal-			
ary of Business			
Manager.....	.....	900.00	900.00
(C.M. 2142) Shun-			
tehfu Hospital, for			
maintenance, \$750.00			
per year for five			
years, beginning with			
1916. (Installment			
due 1917).....	.....	750.00	.....
<i>Carried Forward</i>	\$32,886.25	\$45,939.00	\$14,133.75

EXHIBIT K—Continued

	PRIOR APPROPRIA- TIONS	1917 APPROPRIA- TIONS	1917 PAYMENTS
<i>Brought Forward</i>	\$32,886.25	\$45,939.00	\$14,133.75
MISSIONARY SOCIETIES—			
HOSPITALS (<i>Cont.</i>):			
Board of Foreign Mis- sions of the Presby- terian Church in the U. S. A. (<i>Cont.</i>):			
(C.M. 2144) Changteh Hospital, for current expenses, \$2,625.00 per year for five years, beginning with 1916. (Balance of install- ment due 1916)	1,800.00	.....	225.00
(Installment due 1917).....	.....	2,625.00	.....
(C.M. 2145) Changteh Hospital, for capital expenditures.....	13,050.00	.....	.....
Canton Christian Col- lege.			
(C.M. 2139) Canton Hospital, for a busi- ness manager and current expenses, \$4,- 500.00 per year for five years, beginning with 1917. (Install- ment due 1917)....	.....	4,500.00	4,500.00
Church of Scotland For- eign Mission Com- mittee.			
(C.M. 288) Ichang Hospital, for equip- ment.....	375.00	.....	.....
(C.M. 289) Ichang Hospital, for support of a third foreign doctor and nurse, \$2,250.00 per year for five years, be- ginning with 1918..	.....	.....	.....
<i>Carried Forward</i>	\$48,111.25	\$53,064.00	\$18,858.75

EXHIBIT K—*Continued*

	PRIOR APPROPRIA- TIONS	1917 APPROPRIA- TIONS	1917 PAYMENTS
<i>Brought Forward</i>	\$48,111.25	\$53,064.00	\$18,858.75
MISSIONARY SOCIETIES—			
HOSPITALS (<i>Cont.</i>):			
Executive Committee of Foreign Missions of the Presbyterian Church in the United States, South.			
(C.M. 221, 2101) Soo- chow, for salary, out- fit and travel to field of doctor and foreign nurse; Kashing, for salary, outfit and travel to field of for- eign nurse. Salaries, \$3,600.00 per year for five years, begin- ning with 1915. (Bal- ance of installments from previous years) (Installment due 1917)	7,750.00 .....	..... 3,600.00	3,125.00
Foreign Christian Mis- sionary Society.			
(C.M. 215, 2100) Luch- owfu, for salaries, al- lowances and outfits of doctor and nurse; Nantungchow, for salary allowance and outfit of nurse. Sal- aries and allowances, \$4,200.00 per year for five years, begin- ning with 1918. . . . .	.....	.....	.....
(C.M. 2218) Nantung- chow Hospital, for support of a second physician, \$8,400.00 extending over a per- iod of five years, be- ginning with 1918 . . . . .	.....	.....	.....
(C.M. 2219) Nantung- chow Hospital, for doctor's residence . . . . .	.....	3,000.00	.....
<i>Carried Forward</i>	\$55,861.25	\$59,664.00	\$21,983.75

EXHIBIT K—*Continued*

	PRIOR APPROPRIA- TIONS	1917 APPROPRIA- TIONS	1917 PAYMENTS
<i>Brought Forward</i>	\$55,861.25	\$59,664.00	\$21,983.75
MISSIONARY SOCIETIES— HOSPITALS (<i>Cont.</i>):			
Foreign Christian Mission- ary Society. (<i>Cont.</i>):			
(C.M. 2220) Luchow- fu Hospital, for sup- port of a Chinese doctor.....	.....	360.00	360.00
Foreign Mission Board of the Southern Bapt- ist Convention.			
(C.M. 279) Laichowfu Hospital, for salary of additional physi- cian and wife, and nurse, \$1,650.00 per year for five years, beginning with 1918	.....	.....	.....
(C.M. 280) Laichowfu Hospital, for equip- ment and outgoing expenses of a physi- cian and wife.....	750.00	.....	.....
(C.M. 281) Hwanghien Hospital, for salary of physician, \$900.00 per year for five years, beginning with 1918.....	.....	.....	.....
(C.M. 282) Hwang- hien Hospital, for outfit and travel of a physician.....	750.00	.....	.....
(C.M. 225, 2103) War- ren Memorial Hos- pital, Hwanghien, for salary of a nurse, \$600.00 per year for five years, beginning with 1916. (Balance of Installment due 1916).....	600.00	.....	600.00
(Installment due 1917).....	.....	600.00	450.00
<i>Carried Forward</i>	\$57,961.25	\$60,624.00	\$23,393.75

EXHIBIT K—Continued

	PRIOR APPROPRIA- TIONS	1917 APPROPRIA- TIONS	1917 PAYMENTS
<i>Brought Forward</i>	\$57,961.25	\$60,624.00	\$23,393.75
MISSIONARY SOCIETIES—			
HOSPITALS (Cont.):			
Foreign Mission Board of the Southern Baptist Convention (Cont.):			
(C.M. 232, 2104) Yang- chow Hospital, for salary of a nurse, \$600.00 per year for five years, beginning with 1916. (Balance of installment due 1916)	450.00	.....	450.00
(Installment due 1917) . . . . .	.....	600.00	175.00
(C.M. 228, 2106) Cheng- chow, for salary of a doctor, \$1,200.00 per year for five years, beginning with 1916. (Balance of install- ment due 1916)	850.00	.....	850.00
(Installment due 1917) . . . . .	.....	1,200.00	350.00
London Missionary So- ciety.			
(C.M. 2167) Siochang Hospital, for support of an additional nurse, \$600.00 per year for five years, beginning with 1918 . . . . .	.....	.....	.....
Medical Mission Auxili- ary of London, E. C.			
(C.M. 2201) Tai Yuan Fu Hospital, for im- provements and sup- plies . . . . .	.....	3,150.00	.....
United Free Church of Scotland.			
(C.M. 2232) Mukden Hospital, for sup- port of nurse, \$750.00 per year for five years, beginning with 1918 . . . . .	.....	.....	.....
(C.M. 2233) Mukden Hospital, for im- provements . . . . .	.....	9,000.00	.....
<i>Carried Forward</i>	\$59,261.25	\$74,574.00	\$25,218.75

EXHIBIT K—*Continued*

	PRIOR APPROPRIA- TIONS	1917 APPROPRIA- TIONS	1917 PAYMENTS
<i>Brought Forward</i>	\$59,261.25	\$74,574.00	\$25,218.75
MISSIONARY SOCIETIES— HOSPITALS (<i>Cont.</i>):			
University of Nanking. (C.M. 2137) For cur- rent expenses of its hospital, \$9,250.00 per year for five years, beginning with 1917. (Installment due 1917).....	.....	9,250.00	9,250.00
(C.M. 2138) For build- ings and equipment.	25,000.00	.....	13,000.00
Woman's Foreign Mis- sionary Society of the Methodist Epis- copal Church. (C.M. 2175) Isabella Fisher Hospital, Tien- tsin, for equipment.	.....	1,500.00	1,500.00
Loss in Exchange. (C.M. 2251) To cover loss in exchange on payments to Mis- sionary Societies, for their hospitals, during 1917.....	.....	20,000.00	.....
FELLOWSHIPS:			
Medical Missionaries and Nurses on Furlough.	10,516.68	32,700.00	23,312.30
Medical Fellowships, Chinese.....	4,636.24	9,900.00	7,525.61
Miscellaneous Fellowships	5,095.00	10,000.00	3,910.00
SCHOLARSHIPS:			
Students of Harvard Med- ical School in China	2,973.31	12,000.00	6,263.48
Chinese Pharmacists ...	2,199.00	2,610.00	2,754.00
Chinese Nurses.....	1,600.00	4,000.00	750.00
MEDICAL SCHOOLS—UN- AFFILIATED:			
St. John's University of Pennsylvania Medi- cal School, Shanghai. (C.M. 2200) For sup- port of teacher of anatomy and dissec- tion.....	.....	1,500.00	1,500.00
<i>Carried Forward</i>	\$111,281.48	\$178,034.00	\$94,984.14

EXHIBIT K—*Continued*

	PRIOR APPROPRIA- TIONS	1917 APPROPRIA- TIONS	1917 PAYMENTS
<i>Brought Forward</i>	\$111,281.48	\$178,034.00	\$94,984.14
MEDICAL SCHOOLS—UN- AFFILIATED (<i>Cont.</i>):			
Tsinanfu Union Medical College.			
(C.M. 251) For build- ings and equipment.	30,000.00	.....	26,763.45
(C.M. 252) For cur- rent expenses of edu- cating students sent to Tsinanfu by the China Medical Board during a period of five years.	90,000.00	.....	28,150.90
(C.M. 2217) To cover loss in exchange in connection with ap- propriations C.M. 251 and 252. ....	.....	20,000.00	.....
Yale Foreign Missionary Society.			
(C.M. 27) For support of Hunan-Yale Med- ical School, Chang- sha, \$16,200.00 per year for five years, beginning with 1915. (Balance of install- ment due 1916).	8,100.00	.....	8,100.00
(Installment due 1917). ....	.....	16,200.00	8,100.00
(C.M. 2133) For lab- oratory and equip- ment at medical school, Changsha. . .	30,000.00	.....	20,000.00
(C.M. 2230) For ex- tended budget of Hu- nan-Yale Medical School, Changsha, \$9,000.00 extending over a period of three years begin- ning with 1917. (In- stallment due 1917). .	.....	4,000.00	4,000.00
<i>Carried Forward</i>	\$269,381.48	\$218,234.00	\$190,098.49

EXHIBIT K—*Continued*

	PRIOR APPROPRIA- TIONS	1917 APPROPRIA- TIONS	1917 PAYMENTS
<i>Brought Forward</i>	\$269,381.48	\$218,234.00	\$190,098.49
MEDICAL SCHOOLS—UN- AFFILIATED (<i>Cont.</i>):			
Yale Foreign Missionary Society. (<i>Cont.</i>):			
(C.M. 2231) For sup- port of a third in- structor in the Pre- Medical Department of the Hunan-Yale Medical School, \$6,- 200.00 extending over a period of three years, beginning with 1917. (Installment due 1917).....	.....	2,700.00	2,700.00
(C.M. 2249) To cover loss in exchange in connection with ap- propriation C.M. 2133.....	.....	8,500.00	7,764.75
MEDICAL SCHOOLS—AF- FILIATED:			
Peking Union Medical College.			
Assets:			
(C.M. 212) Purchase of Union Medical Col- lege, Peking.....	26,368.21	.....	.....
(C.M. 213, 2212, 2213) Purchase of addi- tional property....	4,147.96	17,400.00	.....
(C.M. 248) Purchase of small adjoining lot.....	1,080.00	.....	1,076.71
(C.M. 239) Purchase of property of Prince Yu.....	61,406.30	1,214.50	62,620.80
(C.M. 249) Miscel- laneous land pur- chases.....	18,923.29	.....	6,521.52
(C.M. 2170) Purchase of land adjoining Prince I's property .	.....	3,000.00	.....
(C.M. 2165) Plans for a hospital and labor- atory.....	1,000.00	.....	.....
<i>Carried Forward</i>	\$382,307.24	\$251,048.50	\$270,782.27

EXHIBIT K—Continued

	PRIOR APPROPRIA- TIONS	1917 APPROPRIA- TIONS	1917 PAYMENTS
<i>Brought Forward</i>	\$382,307.24	\$251,048.50	\$270,782.27
MEDICAL SCHOOLS—AF- FILIATED (<i>Cont.</i>):			
Peking Union Medical College.			
Assets (<i>Cont.</i>):			
(C.M. 2196, 2228, 2267) Buildings and fixed equipment.....	.....	252,600.00	.....
(C.M. 2197) Movable equipment.....	.....	25,000.00	.....
(C.M. 2188, 2214) Re- pairs and alterations	.....	32,800.00	.....
Accessories:			
(C.M. 266, 2198) Fur- nishings, apparatus, etc.....	1,141.26	25,000.00	.....
Operation in China:			
(C.M. 219, 273, 2107) Budget, Previous years.....	79,291.08	.....	37,320.19
(C.M. 2190) Budget 1917-18.....	.....	92,000.00	.....
(C.M. 2246) Traveling expenses of Miss Su- san H. Connelly....	.....	316.85	316.85
(C.M. 2262) Outfit and travel of Dr. F. H. Dieterich.....	.....	615.87	.....
Administration in U. S. A.			
(C.M. 299, 2159, 2168, 2192) Budget 1916- 17.....	12,312.32	500.00	8,018.42
(C.M. 2191) Budget 1917-18.....	.....	26,000.00	6,039.55
Pre-Medical School Ad- ministration.			
Accessories:			
(C.M. 2161) Furnish- ings, apparatus, etc.	15,000.00	.....	.....
Operation:			
(C.M. 2162) Budget 1917-18.....	.....	26,000.00	1,000.00
Red Cross Hospital, Shanghai.			
Accessories:			
(C.M. 2109) Automo- bile and ambulance.	510.00	.....	.....
<i>Carried Forward</i>	\$490,561.90	\$731,881.22	\$323,477.28

EXHIBIT K—*Continued*

	PRIOR APPROPRIA- TIONS	1917 APPROPRIA- TIONS	1917 PAYMENTS
<i>Brought Forward</i>	\$490,561.90	\$731,881.22	\$323,477.28
MEDICAL SCHOOLS—AF- FILIATED (<i>Cont.</i>):			
Red Cross Hospital, Shanghai. (<i>Cont.</i>)			
Administration:			
(C.M. 256, 268) Bud- get 1916-17.....	19,667.89	.....	14,527.78
(C.M. 256, 2248) Bud- get 1917-18.....	.....	51,209.00	.....
Shanghai Medical School.			
Assets:			
(C.M. 2199) Build- ings and fixed equip- ment.....	.....	22,000.00	.....
(C.M. 2215) Library.	.....	3,000.00	179.86
Administration:			
(C.M. 2193, 2169) Sal- ary and traveling ex- penses.....	.....	6,500.00	3,673.96
Purchase of Land in China (C.M. 2110).	195,582.62	.....	122,693.62
MISCELLANEOUS:			
Emergency Fund:			
(C.M. 2211) For aid of medical work of va- rious kinds in China, at the discretion of the Resident Di- rector .....	.....	3,000.00	.....
Translation:			
Nurses Association of China.			
(C.M. 2185) For trans- lation of nursing text books .....	.....	600.00	.....
Cousland, Dr. P. B.			
(C.M. 2135) For ex- penses, 1916.....	881.36	.....	881.36
(C.M. 2136, 2245) For expenses, 1917 .	.....	2,500.00	2,500.00
Income Tax:			
(C.M. 2247) Income tax on non-resident aliens .....	.....	2,500.00	.....
<i>Carried Forward</i>	\$706,693.77	\$823,190.22	\$467,933.86

EXHIBIT K—Continued

	PRIOR APPROPRIA- TIONS	1917 APPROPRIA- TIONS	1917 PAYMENTS
<i>Brought Forward</i>	\$706,693.77	\$823,190.22	\$467,933.86
MISCELLANEOUS. (Cont.):			
Peking Office—Adminis- tration.			
(C.M. 260, 271, 274)			
Budget 1916-17.....	10,216.86	.....	9,431.39
(C.M. 2195, 2250)			
Budget July 1 to De- cember 31, 1917....	.....	13,750.00	3,750.00
ADMINISTRATION:			
Home Office.			
(C.M. 275, 2264) Bud- get 1916-17.....	10,545.52	5,000.00	11,356.23
(C.M. 2194, 2265)			
Budget July 1 to De- cember 31, 1917....	.....	13,300.00	8,950.24
		<u>\$855,240.22</u>	
Balance of funds appropri- ated by the Rockefeller Foundation for the Board's work during 1917 remaining unap- propriated by the China Medical Board on December 31, 1917.	.....	1,445.28	.....
	<u>\$727,456.15</u>	<u>\$856,685.50</u>	
Unexpended balances of ap- propriations and un- appropriated balance allowed to lapse.....	36,744.77	13,575.22	.....
	<u><u>\$690,711.38</u></u>	<u><u>\$843,110.28</u></u>	<u><u>\$501,421.72</u></u>

EXHIBIT L

SUMMARY OF APPROPRIATIONS AND PAYMENTS

	PRIOR APPROPRIA- TIONS	1917 APPROPRIA- TIONS	1917 PAYMENTS
INTERNATIONAL HEALTH BOARD.	\$81,249.72	\$856,362.49	\$557,829.18
CHINA MEDICAL BOARD.....	690,711.38	843,110.28	501,421.72
WAR WORK.....	267,625.94	7,898,714.28	5,944,968.53
AFTER CARE OF INFANTILE PARAL- YSIS CASES.....	18,401.27	36,800.00	44,737.49
MENTAL HYGIENE.....	7,800.00	55,500.00	48,800.00
ROCKEFELLER INSTITUTE—EN- DOWMENT AND CURRENT EX- PENSES.....	1,151,061.32	2,137,156.08	3,127,913.68
SCHOOL OF HYGIENE AND PUBLIC HEALTH.....	237,000.00	72,790.00	31,319.70
FOUNDER'S DESIGNATIONS.....	907,488.11	34,763.31	942,251.42
MISCELLANEOUS.....	29,000.00	153,689.86	152,178.36
ADMINISTRATION.....	.....	111,702.18	105,532.28
	<u>\$3,390,337.74</u>	<u>\$12,200,588.48</u>	<u>\$11,456,952.36</u>
Prior appropriations.....	\$3,390,337.74		
1917 appropriations.....		12,200,588.48	
Total appropriations.....			\$15,590,926.22
1917 payments.....			11,456,952.36
Balance payable on appropriations.....			<u>\$4,133,973.86</u>

EXHIBIT M

ADDITIONAL APPROPRIATIONS FOR FUTURE YEARS

In addition to the foregoing, the Foundation has made pledges and appropriations which become effective in future years, and will require for payment the following amounts:

YEAR 1918:

INTERNATIONAL HEALTH BOARD .	\$1,500,000.00	
CHINA MEDICAL BOARD	1,345,657.00	
WAR WORK.....	2,943,000.00	
AFTER CARE OF INFANTILE PARALYSIS CASES.....	15,000.00	
MENTAL HYGIENE.....	7,000.00	
ROCKEFELLER INSTITUTE AND MEDICAL EDUCATION	49,000.00	
SCHOOL OF HYGIENE AND PUBLIC HEALTH.....	110,617.00	
MISCELLANEOUS.....	253,463.00	
		<hr/>
		\$6,223,737.00
Year 1919.....		1,110,000.00
Year 1920.....		1,575,000.00
Year 1921.....		65,000.00
Year 1922.....		60,000.00
Year 1923.....		55,000.00
Year 1924.....		15,000.00
		<hr/>
		<u>\$9,103,737.00</u>

In addition to the foregoing, the China Medical Board has made pledges and appropriations which become effective in future years, and will require for payment the following amounts:

Year 1918.....	\$1,106,607.00
Year 1919.....	251,913.00
Year 1920.....	91,827.00
Year 1921.....	66,900.00
Year 1922.....	50,225.00
Year 1923.....	22,700.00
	<hr/>
	<u>\$1,590,172.00</u>

As the appropriation to the China Medical Board, included in the Foundation's requirements for future years, provides for the 1918 appropriations of the Board, this item is deducted

1,106,607.00

\$483,565.00

EXHIBIT N

STATEMENTS OF PRINCIPAL FUNDS

GENERAL FUND

Gifts from May 29, 1913 to December 31, 1916	\$100,000,000.00
Gift from Mr. Rockefeller, February 28, 1917	25,765,506.00
Gift from Mr. Rockefeller, as of March 6, 1914	350.00
	<hr/>
	\$125,765,856.00
Less amount made available for appropriation by action of Board, accounted for in Exhibit B	5,000,000.00
	<hr/>
Balance	\$120,765,856.00
	<hr/>
The total fund is invested in the securities listed in General Schedule, Exhibit Q	\$120,765,856.00
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ESTATE OF LAURA S. ROCKEFELLER FUND

Balance of gifts January 1st, 1917	\$177,733.00
Less amount made available for appropriation by action of Board, accounted for in Exhibit B	25,000.00
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Balance	\$152,733.00
	<hr/>
The total fund is invested in the securities listed in General Schedule, Exhibit Q	\$152,733.00
	<hr/>

RESERVE

Balance January 1, 1917	\$1,770,414.79
Loss on securities sold and redeemed during the year	554,501.94
	<hr/>
Balance	\$1,215,912.85
	<hr/>
The total fund is invested in the securities listed in General Schedule, Exhibit Q	\$1,215,912.85
	<hr/>

EXHIBIT N—*Continued*

LAURA S. ROCKEFELLER FUNDS

Gifts		\$49,300.00
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The total fund is invested in the securities listed in Exhibit R ...	\$49,300.00	
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JOHN D. ROCKEFELLER FUND

Gifts		\$37,000.00
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The total fund is invested in the securities listed in Exhibit R ...	\$37,000.00	
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EXHIBIT O

LAND, BUILDINGS, AND EQUIPMENT FUNDS

Appropriations to December 31, 1916		\$630,959.37
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From this is deducted the value of merchandise, drugs, etc., now withdrawn from this account and carried as a receivable.	\$13,599.22	
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Amount of depreciation of Foundation's equipment for years 1913-1916, inclusive, is also deducted	5,695.04	
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		19,294.26
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Balance		\$611,665.11
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Appropriations to China Medical Board expended for real and personal property during the year:		
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Additional cost Peking Union Medical College	\$104.88	
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Additional land Peking Union Medical College	70,219.03	
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Library Peking Union Medical College	4,033.04	
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Miscellaneous land purchases in China	122,693.62	
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Library Shanghai Medical School	179.86	
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	\$197,230.43	
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Appropriations for taxes on Grand Chenier Tract	1,619.52	
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Foundation Library and Equipment	2,189.86	
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		201,039.81
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Carried Forward		\$812,704.92
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EXHIBIT O—*Continued*LAND, BUILDINGS, AND EQUIPMENT FUNDS—*Continued*

<i>Brought Forward</i>		\$812,704.92
This fund is represented by the following property:		
The Rockefeller Foundation:		
Grand Chenier Tract		
(Land, taxes, fees, etc.)	\$235,493.99	
Furniture and Fixtures..	11,238.07	
Library—New York City	1,176.07	
		\$247,908.13
China Medical Board:		
Property of Peking Union		
Medical College	\$189,860.54	
Property of Prince Yu—		
China	126,214.50	
Property of Mr. Ying—		
China	20,381.51	
Miscellaneous land pur-		
chases	194,709.23	
Harvard Medical School.	28,800.00	
Equipment—New York		
City	618.11	
Equipment—Peking, China	4,033.04	
Equipment — Shanghai,		
China	179.86	
		564,796.79
		<hr/>
		\$812,704.92 \$812,704.92
		<hr/> <hr/>

EXHIBIT P

TRANSACTIONS RELATING TO INVESTED FUNDS

SECURITIES SOLD, REDEEMED, AND EXCHANGED

NAME	INTEREST RATE	PROCEEDS	
American Agricultural Chemical Co. First Mortgage.....	5	\$15,450.00	Gain \$300.00
Atlantic Coast Line Ry. First Consolidated Mortgage.....	4	390,981.00	Loss 64,019.00
Central Pacific Ry. Thirty-Year guaranteed.....	3½	1,817.50	Gain 37.50
Chicago, Burlington & Quincy R. R. General Mortgage.....	4	791,590.00	Loss 143,410.00
Denver & Rio Grande R.R. First Consolidated Mortgage.....	4	4,890.00	Loss 210.00
Euclid Heights property mortgages, liquidated in full by payment during year, of.....		9,504.00	
Kansas City Southern Ry. First Mortgage.....	3	143,564.00	Loss 29,873.50
Lake Shore & Michigan Southern Ry. Debenture.....	4	818,130.00	Loss 101,870.00
Long Island R.R. Refunding Mortgage.....	4	1,785.00	Loss 15.00
Louisville & Nashville R.R. Unified Mortgage.....	4	5,790.00	Gain 210.00
Magnolia Petroleum Co. First Mortgage.....	6	33,000.00	
Missouri Pacific Ry. Co. Collateral Trust 4% Bonds exchanged for preferred stock of reorganized company, as shown in next table, at market value of.....			
New York Central Lines Equipment Trust.....	4½	1,219,890.00	Loss 98,910.00
New York City Three-Year Revenue.....	6	36,000.00	Gain 345.85
		94,000.00	

EXHIBIT P—Continued
SECURITIES SOLD, REDEEMED, AND EXCHANGED—Continued

	NAME	INTEREST RATE	PROCEEDS	
\$250,000.	Northern Pacific Ry. General Lien	3	\$137,500.00	Loss \$25,000.00
51,925.	Ohio Fuel Supply Co. Debenture	6	51,925.00	
520,000.	Pere Marquette Ry. Consolidated Mortgage 4% Bonds exchanged for preferred stock of reorgan- ized company, as shown in next table, at market value of \$313,248.00 and cash amounting to \$14,352.00			
100,000.	Southern Pacific Branch Ry. First Mortgage	6	327,600.00	Gain 6,484.80
1,000,000.	Union Pacific R.R. Refunding Mortgage	4	123,625.00	Loss 158,413.00
45,000.	Wabash R.R. Omaha Division First Mortgage	3½	742,837.00	Gain 4,106.25
434,000.	Wheeling & Lake Erie R.R. First Consolidated Mortgage	4	33,356.25	Gain 3,817.50
50	Shares Borne-Strymser Co.		351,017.50	Gain 8,292.76
220	Shares Chehalis & Pacific Land Co. Dividends of \$4.00 per share in liquidation, credited to cost of stock		23,042.76	
619	Shares Colonial Oil Co. Dividend of \$50.00 per share in liquidation, added to Reserve		880.00	
300	Shares Cumberland Pipe Line Co.		30,950.00	Gain 30,950.00
842	Shares Galena Signal Oil Co. Common		39,903.20	Gain 18,303.20
1,900	Shares H. H. Kohlsaat Co. in bankruptcy. Elim- inated from assets and valuation charged against Reserve		146,122.99	Loss 13,856.85
138	Shares National Fuel Gas Co.			Loss 95,000.00
300	Shares National Lead Co. Preferred		36,409.23	Gain 8,406.73
6,567 ⁴⁸ / ₁₀₀	Shares Ohio Fuel Supply Co.		33,853.39	Gain 2,653.39
			313,545.76	Gain 84,778.09

500	Shares Pressed Steel Car Co. Preferred	\$52,291.67	Gain	\$7,416.67
65	Shares Swan & Finch Co.	7,270.57	Loss	5,520.21
105	Shares Union Tank Line Co.	9,959.78	Gain	2,609.78
300	Shares U. S. Rubber Co. First Preferred	33,252.50	Gain	2,883.10
500	Shares The Western Maryland Ry. Preferred Stock exchanged for preferred stock of reorganized com- pany as shown in next table, at unchanged valua- tion	23,000.00		
TOTALS		<u>\$6,084,734.10</u>	Net Loss	<u>\$54,501.94</u>

EXHIBIT P—Continued
TRANSACTIONS RELATING TO INVESTED FUNDS—Continued

SECURITIES BOUGHT AND RECEIVED THROUGH EXCHANGE			INTEREST		PRICE		TOTAL
	NAME		RATE	PER CENT	PER CENT		COST
\$1,000,000.	Bethlehem Steel Co. Two-Year Secured Gold Notes		5	98.25		\$982,500.00	
500,000.	Wheeling & Lake Erie R.R. Equipment Trust Series "B"		5	99.75		498,750.00	
1,000.	Shares Cumberland Pipe Line Co.			100.		100,000.00	
21,980.	Shares Missouri Pacific R.R. Voting Trust Certificates for Convertible Preferred Stock, received in exchange for Missouri Pacific Ry. Collateral Trust 4% Bonds under plan of reorganization. Valued at current quotation on day of receipt ..						
2,513 ⁴ / ₁₀₀	Shares Ohio Fuel Supply Co. (Par \$25.00)			55.50		1,219,890.00	
5,740 ⁸ / ₁₀₀	Shares Pere Marquette Ry. Preferred Stock, received in exchange for Pere Marquette R.R. Consolidated Mortgage 4% Bonds under plan of reorganization. Valued at about the current market quotation on day of receipt.			100.		62,837.00	
500	Shares Western Maryland Ry. Second Preferred Stock, received in exchange for The Western Maryland Ry. Preferred Stock under plan of reorganization. Valuation of old shares given to new.			54.565		313,248.00	
				46.		23,000.00	
TOTAL.....						\$3,200,225.00	

SECURITIES RECEIVED AS GIFTS

Received from Mr. John D. Rockefeller:

10 Shares American Ship Building Co. Common at \$35.00 per share.....	\$350.00
29,718 Shares Standard Oil Co. (Indiana) at \$867.00 per share.....	25,765,506.00
TOTAL.....	<u>\$25,765,856.00</u>

SECURITIES GIVEN TO THE ROCKEFELLER INSTITUTE FOR MEDICAL RESEARCH ON ACCOUNT OF FOUNDATION'S APPROPRIATION OF \$2,000,000

\$762,000. Lake Shore & Michigan Southern Ry. Debenture.....	4	\$701,040.00
1,298,000. Magnolia Petroleum Co. First Mortgage.....	6	1,298,000.00
TOTAL.....		<u>\$1,999,040.00</u>

EXHIBIT Q

SCHEDULE OF SECURITIES IN GENERAL FUNDS ON DECEMBER 31, 1917, REPRESENTING
BOTH PRINCIPAL AND INCOME TEMPORARILY INVESTED

BONDS

NAME	INTEREST RATE PER CENT.	DATE OF MATURITY	AMOUNT	PRICE PERCENT.	CASH PRICE
American Agricultural Chemical Co. First Mortgage Convertible	5	Oct. 1928	\$485,000	101.	\$489,850.00
American Telephone & Telegraph Co. Thirty-Year Col- lateral Trust	5	Dec. 1946	100,000	97.75	97,750.00
Anglo-French External Loan	5	Oct. 15'20	600,000	96.0862	576,517.20
Armour & Co. Real Estate First Mortgage	4½	June 1939	1,000,000	93.25	932,500.00
Ashland Power Co. First Mortgage	5	Mar. 1928	8,000	100.	8,000.00
Atlantic & Birmingham Ry. First Mortgage	5	Jan. 1934	677,000	90.	609,300.00
Baltimore & Ohio R.R. Refunding and General Mort- gage	5	Dec. 1995	650,000	99.75	648,375.00
Bethlehem Steel Co. Two-Year Secured Notes	5	Feb. 15'19	1,000,000	98.25	982,500.00
Chicago & Alton R.R. Refunding Mortgage	3	Oct. 1949	551,000	65.	358,150.00
Chicago & Alton Ry. First Lien	3½	Jul. 1950	854,000	53.	452,620.00
Chicago City & Connecting Railways Collateral Trust ..	5	Jan. 1927	1,305,000	85.	1,109,250.00
Chicago & Eastern Illinois R.R. Refunding and Im- provement Mortgage	4	July 1955	300,000	63.	189,000.00
Chicago, Milwaukee & St. Paul Ry. General Mortgage Series "A"	4	May 1989	30,000	97.	29,100.00
Chicago, Milwaukee & St. Paul Ry. General Mortgage Series "C"	4½	May 1989	500,000	103.	515,000.00

Chicago, Milwaukee & St. Paul Ry. Debenture	4	July 1934	\$450,000	88.2838	\$397,277.50
Chicago, Milwaukee & St. Paul Ry. General and Refunding Mortgage Series "A"	4½	Jan. 2014	500,000	91.0625	455,312.50
Chicago & North Western Ry. Extension	4	Aug. 15'26	50,000	95.	47,500.00
Chicago & North Western Ry. Sinking Fund Debenture	5	May 1933	80,000	102.	81,600.00
Chicago Railways Co. First Mortgage	5	Feb. 1927	500,000	97.	485,000.00
Cleveland, Cincinnati, Chicago & St. Louis Ry. St. Louis Division, Collateral Trust	4	Nov. 1990	73,000	90.	65,700.00
Cleveland, Cincinnati, Chicago & St. Louis Ry. General Mortgage	4	June 1993	700,000	83.893	587,250.00
Cleveland Short Line First Mortgage	4½	Apr. 1961	500,000	95.	475,000.00
Colorado Industrial Co. First Mortgage	5	Aug. 1934	2,000,000	80.	1,600,000.00
Consolidated Gas Co. (New York) Convertible Debenture	6	Feb. 1920	500,000	110.	550,000.00
Dominion of Canada, Government of, Fifteen-Year	5	Apr. 1931	500,000	94.565	472,825.00
Erie R.R. General Mortgage Convertible Fifty-Year Series "B"	4	Apr. 1953	1,065,000	74.7175	795,742.30
Illinois Central R.R. Refunding Mortgage	4	Nov. 1955	300,000	87.	261,000.00
Interborough Rapid Transit Co. First Mortgage	5	Jan. 1966	1,750,000	96.8571	1,695,000.00
International Mercantile Marine Co. First and Collateral Trust Sinking Fund	6	Oct. 1941	2,848,290	97.5	2,777,082.75
Lake Erie & Western R.R. Second Mortgage	5	July 1941	100,000	100.	100,000.00
Lake Shore & Michigan Southern Ry. First Mortgage	3½	June 1997	926,000	87.	805,620.00
Lake Shore & Michigan Southern Ry. Debenture	4	May 1931	1,673,000	92.	1,539,160.00
Magnolia Petroleum Co. First Mortgage	6	Jan. 1937	1,809,000	100.	1,809,000.00
Missouri, Kansas & Texas Ry. General Mortgage Sinking Fund	4½	Jan. 1936	1,325,000	84.	1,113,000.00
Morris & Essex R.R. First and Refunding Mortgage	3½	Dec. 2000	175,000	82.75	144,812.50

EXHIBIT Q—Continued
SCHEDULE OF SECURITIES—Continued
BONDS

NAME	INTEREST RATE PER CENT.	DATE OF MATURITY	AMOUNT	PRICE PERCENT.	CASH PRICE
Mutual Fuel Gas Co. First Mortgage.....	5	Nov. 1947	\$250,000	100.	\$250,000.00
National Railways of Mexico, Prior Lien Fifty-Year Sinking Fund with January, 1915, and subsequent coupons attached.....	4½	July 1957 Jan. 1917	50,000 1,125	59. 59.	29,500.00 663.75
Secured 6% Notes for coupon due January 1, 1914, Guaranty Trust Co. Receipts for July 1, 1914, coupon.....			1,125	59.	663.75
New Orleans, Texas & Mexico Ry. Non-Cumulative Income Series "A".....	5	Oct. 1935	180,000	42.	75,600.00
New York Central Lines Equipment Trust of 1913...	4½	Jan. '18-'28	396,000	99.039	392,195.66
New York Central & Hudson River R.R. Thirty- Year Debenture.....	4	May 1934	330,000	88.45	291,885.00
New York, Chicago & St. Louis R.R. First Mortgage	4	Oct. 1937	35,000	95.	33,250.00
New York, Chicago & St. Louis R.R. Debenture	4	May 1931	1,303,000	87.	1,133,610.00
New York City Corporate Stock.....	4½	Mar. 1964	100,000	94.5	94,500.00
New York Connecting R.R. First Mortgage.....	4½	Aug. 1953	500,000	95.69073	478,453.65
Northern Pacific Ry. Refunding and Improvement Mortgage.....	4½	July 2047	390,000	91.577	357,150.00
Pennsylvania R.R. Consolidated Mortgage Sterling	4	May 1948	\$2,400	99.	11,880.00
Pennsylvania R.R. General Mortgage.....	4½	June 1965	\$1,000,000	98.25	1,473,750.00
Philadelphia Co. Convertible Debenture.....	5	May 1922	1,000,000	97.	970,000.00
Philadelphia Co. Convertible Debenture.....	5	Aug. 1919	500,000	95.	475,000.00

Pittsburg, Cincinnati, Chicago & St. Louis Ry. Consolidated Mortgage Series "I".....	4½	1933	\$500,000	103.	\$515,000.00
Province of Quebec Five-Year.....	5	Apr. 1920	500,000	99.75	498,750.00
Reading Co.—Philadelphia & Reading Coal & Iron Co. General Mortgage.....	4	1937	500,000	94.25	471,250.00
Rutland R.R. First Consolidated Mortgage.....	4½	July 1941	25,000	90.	22,500.00
St. Louis & San Francisco Ry. Prior Lien Series "A".....	4	July 1950	1,500,000	72.75	1,091,250.00
St. Louis & San Francisco Ry. Adjustment Mortgage.....	6	July 1955	500,000	81.975	409,875.00
Seaboard Air Line Ry. Adjustment Mortgage.....	5	Oct. 1949	455,000	77.	350,350.00
Southern Pacific R.R. First and Refunding Mortgage.....	4	Jan. 1955	100,000	86.	86,000.00
Sunday Creek Co. Collateral Trust.....	5	July 1944	81,000	78.	63,180.00
United Kingdom of Great Britain & Ireland Two-Year Secured Loan.....	5	Sept. 1918	700,000	99.4375	696,062.50
United Kingdom of Great Britain & Ireland Three-Year Notes.....	5½	Nov. 1919	350,000	99.125	346,937.50
United Kingdom of Great Britain & Ireland Five-Year Notes.....	5½	Nov. 1921	350,000	98.375	344,312.50
Wabash R.R. Second Mortgage.....	5	Feb. 1939	120,000	97.8	117,360.00
Washington Ry. & Electric Co. Consolidated Mortgage.....	4	Dec. 1951	450,000	83.5	375,750.00
Western Maryland R.R. First Mortgage.....	4	Oct. 1952	1,032,000	78.8913	814,158.76
Wheeling & Lake Erie R.R. Lake Erie Division First Mortgage.....	5	Oct. 1926	140,000	100.	140,000.00
Wheeling & Lake Erie R.R. Equipment Trust Series "B".....	5	Apr. '18-'27	500,000	99.75	498,750.00
TOTAL BONDS.....					\$36,165,382.82

EXHIBIT Q—Continued
SCHEDULE OF SECURITIES—Continued
STOCKS

NAME	DIVIDEND RATE PER CENT.	NUMBER OF SHARES	PRICE PER CENT.	CASH PRICE
American Ship Building Co. Preferred	7	9,303	85.	\$790,755.00
American Ship Building Co. Common	7	14,982	35.	524,370.00
Atchison, Topeka & Santa Fe Ry. Preferred	5	5,000	98.25	491,250.00
Atchison, Topeka & Santa Fe Ry. Common	6	21,100	95.2563	2,009,908.33
Borne-Scrymser Co.	20	300	295.	88,500.00
The Buckeye Pipe Line Co. (Par \$50)	16	49,693	160.	7,950,880.00
Central National Bank of Cleveland Capital	10	500	159.2222	79,611.10
Chehalis & Pacific Land Co. Capital		220	45.45	10,000.00
Chesebrough Manufacturing Co. Consolidated	14	2,070	223.333	462,300.00
Chicago City & Connecting Ry. Participation Certificates Preferred	1½			
Chicago City & Connecting Ry. Participation Certificates Common		17,530	69.1875	1,212,856.88
Cleveland Arcade Co. Capital		10,518	30.	315,540.00
Cleveland Trust Co. Capital	8	2,500	98.6222	246,555.56
The Colonial Oil Co. (150% paid on account dissolution)	10	286	238.195	68,123.77
Colorado & Southern Ry. First Preferred		619		
Consolidated Gas Co. of N. Y. Capital	4	7,000	54.	378,000.00
The Continental Oil Co.		20,000	127.50	2,550,000.00
Wm. Cramp & Sons Ship & Engine Building Co. Capital	12	7,000	190.	1,330,000.00
The Crescent Pipe Line Co. (Par \$50)	3	648	15.	9,720.00
	6	14,120	60.	847,200.00

Cumberland Pipe Line Co.	10	3,000	81.333	\$244,000.00
Erie R.R. First Preferred.		21,400	45.8306	980,773.76
Eureka Pipe Line Co.	24	12,357	361.3331	4,464,995.59
Galena Signal Oil Co. Preferred.	8	4,193	140.	587,024.13
Galena Signal Oil Co. Common.	12	20,000	189.999	3,799,996.28
Great Lakes Towing Co. Preferred.	7	1,527	88.7361	135,500.05
Great Lakes Towing Co. Common.		1,200	12.	14,400.00
Indiana Pipe Line Co. (Par \$50)	20	24,845	125.111	3,108,385.28
International Agricultural Corporation Preferred.		6,545	30.	196,350.00
International Agricultural Corporation Common.		8,175	5.	40,875.00
Manhattan Ry. Capital.	7	10,000	128.775	1,287,750.00
Missouri Pacific R.R. Voting Trust Certificates for Convertible Preferred.		21,980	55.	1,219,890.00
National Lead Co. Preferred.	7	1,100	104.	114,400.00
National Lead Co. Common.	4	29,400	50.	1,470,000.00
National Transit Co. (Par \$12.50)	8	126,481	28.5	3,604,708.50
New Orleans, Texas & Mexico Ry. Capital.		1,125	16.	18,000.00
New York, Chicago & St. Louis R.R. Second Preferred.	4	400	78.70	31,480.00
New York, Chicago & St. Louis R.R. Common.		100	55.	5,500.00
New York Transit Co.	24	12,392	300.	3,717,600.00
Northern Pacific Ry. Common.	7	700	91.7625	64,233.75
Northern Pipe Line Co.	10	9,000	110.	990,000.00
Otis Steel Co. Preferred.	7	140	90.	12,600.00
Otis Steel Co. Common.	10	329	20.	6,580.00
Pere Marquette Ry. Preferred.		5,740.8	54.56	313,248.00
Provident Loan Certificates (Par \$5,000)	6	40	100.	200,000.00
Seaboard Air Line Ry. Preferred.		4,300	54.	232,200.00
Seaboard Air Line Ry. Common.		3,400	21.	71,400.00
Sheffield Farms Co. Incorporated Preferred.	6	150	99.4	14,910.00

EXHIBIT Q—Continued
SCHEDULE OF SECURITIES—Continued
STOCKS

NAME	DIVIDEND RATE PER CENT.	NUMBER OF SHARES	PRICE PER CENT.	CASH PRICE
The Solar Refining Co.	10	4,964	185.007	\$918,375.00
Southern Pipe Line Co.	24	24,845	229.5556	5,703,308.88
South West Pennsylvania Pipe Lines	12	8,000	160.	1,280,000.00
Standard Oil Co. (Indiana)	24	29,718	867.	25,765,506.00
The Standard Oil Co. (Kansas) ..	24	4,966	275.016	1,365,733.13
Standard Oil Co. (Kentucky) ..	12	14,868	70.2547	1,044,547.23
Standard Oil Co. (Nebraska) ..	20	2,482	270.	670,140.00
The Standard Oil Co. (Ohio) ..	16	17,392	210.	3,652,320.00
Superior Savings & Trust Co. Capital.	12	300	297.6333	89,350.00
Tilden Iron Mining Co. Capital.	5½	1,780	27.35	48,683.46
Union Tank Line Co.	5	24,000	70.	1,680,000.00
U. S. Cast Iron Pipe & Foundry Co. Preferred.	5	1,987	44.444	88,310.89
Washington Oil Co. (Par \$10) ..	40	1,774	30.	53,220.00
Western Maryland Ry. Second Preferred.		500	46.	23,000.00
Western Pacific R.R. Corporation Preferred.	6	20,195	43.5	878,482.50
Western Pacific R.R. Corporation Common.		30,292½	15.25	461,960.62
Wilson Realty Co. Capital.		591	100.	59,100.00
Woman's Hotel Co. Capital.		300	80.	24,000.00
TOTAL STOCKS				\$90,118,408.69

SUMMARY

Bonds.....	\$36,165,382.82
Stocks.....	90,118,408.69
Total Book Value of Investments Belonging to General Funds, Principal and Income.....	<u>\$126,283,791.51</u>

The foregoing investments are apportioned as follows:

General Fund.....	\$120,765,856.00
General Fund Income.....	4,149,289.66
Estate Laura S. Rockefeller Fund.....	152,733.00
Reserve.....	1,215,912.85
TOTAL.....	<u>\$126,283,791.51</u>

EXHIBIT R
SCHEDULE OF SECURITIES IN SPECIAL FUNDS ON DECEMBER 31, 1917
JOHN D. ROCKEFELLER FUND
BONDS

NAME	INTEREST RATE PER CENT.	DATE OF MATURITY	AMOUNT	PRICE PER CENT.	CASH PRICE
Canada Southern Ry. Consolidated Mortgage Series "A".	5	Oct. 1962	\$37,000	100.	\$37,000.00
TOTAL BONDS.....	.....	.....	.....	.....	\$37,000.00

LAURA S. ROCKEFELLER FUNDS
BONDS

Colorado Industrial Co. First Mortgage.....	5	Aug. 1934	\$50,000	80.	\$40,000.00
Virginia-Carolina Chemical Co. First Mortgage.....	5	Dec. 1923	10,000	93.	9,300.00
TOTAL BONDS.....	.....	.....	.....	.....	\$40,300.00

INDEX

ABSHER, D. C.:	PAGE
Junior Field Director for Arkansas, International Health Board.....	73
ACETONE IN AIRCRAFT PRODUCTION.....	278-279
<i>Aedes Calopus</i> (Mosquito).....	198
AFRICA, WEST COAST OF.....	41
AIRCRAFT PRODUCTION, <i>see</i> ACETONE.	
ALABAMA, HOOKWORM DISEASE IN:	
Work of International Health Board for control.....	36
R. B. Hill, Junior Field Director, International Health Board	73
Table showing persons examined, treated, and cured.....	209
Also.....	note, 170
ALL SAINTS DISTRICT, ANTIGUA.....	105
AMERICAN ACADEMY IN ROME.....	64
AMERICAN BOARD OF COMMISSIONERS FOR FOREIGN MISSIONS:	
Grant by China Medical Board for hospital at Tehchow, Shantung.....	237
AMERICAN COMMITTEE FOR ARMENIAN AND SYRIAN RELIEF, <i>see</i> ARMENIAN AND SYRIAN RELIEF.	
AMERICAN RED CROSS:	
Appropriation by Rockefeller Foundation.....	21
Amount expended.....	63
Cooperation with Commission for the Prevention of Tuberculosis in France.....	176, 179
AMERICAN RED CROSS—CHILDREN'S BUREAU:	
Campaign for promotion of child hygiene.....	176, 179
Traveling exhibits.....	183
AMERICAN RED CROSS—WAR COUNCIL:	
Gift from Rockefeller Foundation.....	26, 61
Negotiations with Rockefeller Foundation for assuming care of Belgian Children in Switzerland.....	26-27
AMERICAN SOCIAL HYGIENE ASSOCIATION, COMMISSION OF...29, 64	
<i>See also</i> Camp and Community Welfare Work.	
ANKYLOSTOMA, <i>see</i> HOOKWORM DISEASE.	
ANKYLOSTOME REGULATION IN DUTCH GUIANA.....	143
ANKYLOSTOMIASIS, <i>see</i> HOOKWORM DISEASE.	
ANNUAL FOREIGN MISSIONS CONFERENCE OF NORTH AMERICA, <i>see</i> COMMITTEE ON REFERENCE AND COUNSEL OF ANNUAL FOREIGN MISSIONS CONFERENCE OF NORTH AMERICA.	
<i>Anopheles</i> (Mosquito).....	192
<i>See also</i> Hamburg, Arkansas, <i>under</i> Malaria Control.	

ANTIDYSENTERIC SERUM. <i>see</i> DYSENTERY.	PAGE
ANTIGASEOUS GANGRENE, <i>see</i> GANGRENE, GASEOUS.	
ANTIGUA, HOOKWORM DISEASE IN:	
Completion of campaign.....	36
Percentage of cures under intensive method of treatment....	105
Table showing persons examined, treated, and cured.....	210
ANTIMENINGOCOCCIC SERUM, <i>see</i> MENINGITIS.	
ANTIMOSQUITO MEASURES, <i>see</i> MALARIA CONTROL.	
ANTIPNEUMOCOCCIC SERUM, <i>see</i> PNEUMONIA.	
ANTITETANIC SERUM, <i>see</i> TETANUS.	
ANTITUBERCULOSIS CAMPAIGN, <i>see</i> COMMISSION FOR THE PREVENTION OF TUBERCULOSIS IN FRANCE.	
ANTITUBERCULOSIS DISPENSARIES:	
Department of Eure et Loire.....	175-176
19th Arrondissement, Paris.....	175, 180
Cooperation of American Red Cross.....	176-177
Work of visiting nurse.....	179-180
<i>See also</i> American Red Cross—Children's Bureau; Commission for the Prevention of Tuberculosis in France; Traveling Exhibits for Antituberculosis Work in France; Visiting Nurses in France.	
ARGENTINA.	
Medical education and public health.....	39-40
ARKANSAS, HOOKWORM DISEASE IN:	
Work for control.....	36
Field and State Directors, International Health Board.....	73
Also.....	note, 170
<i>See also</i> Names of places, <i>under</i> Malaria Control.	
ARKANSAS STATE DEPARTMENT OF HEALTH:	
Tests in malaria control in cooperation with United States Public Health Service and International Health Board..	185-186
ARMENIAN AND SYRIAN RELIEF.....	63
ARMITAGE, J. AURIOL:	
Member Board of Trustees, Peking Union Medical College..	221
ASSAM, HOOKWORM DISEASE IN:	
Rate of infection.....	85
AUGERS, FRANCE.....	176
AUSTRALIA, <i>see</i> PAPUA, HOOKWORM DISEASE IN; QUEENSLAND, HOOKWORM DISEASE IN.	
AUSTRIA, <i>see</i> HOOKWORM DISEASE IN MINES.	
AYERS, T. W.....	240
AZEVEDO, PAEZ:	
Senior Field Director for Brazil, International Health Board	73
<i>B. welchii</i> INFECTION <i>see</i> GANGRENE, GASEOUS.	
BACILLARY DYSENTERY, <i>see</i> DYSENTERY.	

BACTERIOLOGY:	PAGE
Training courses established at War Demonstration Hospital, Rockefeller Institute of Medical Research.....	267-269
<i>See also</i> Chemistry; Serums; Tests, Bacteriological and Chemical in Preventing Epidemics.	
BAILEY, DR. C. A.:	
State Director for Salvador, International Health Board....	74
BANGKOK, SIAM.....	111
BARBER, MARSHALL A.:	
Member Uncinariasis Commission to Orient.....	75
BARNES, DR. MELVILLE E.:	
State Director for Siam, International Health Board	74
BARTON, JAMES L.:	
Vice-Chairman and Member Board of Trustees, Peking Union Medical College.....	221
BASS, DR. C. C.:	
Experiments in malaria control, Bolivar County, Mississippi	185
BAXTER, DONALD E.:	
Business Manager, Peking Union Medical College.....	228
BECKER, W. C.:	
Junior Field Director for Texas, International Health Board..	74
BELGIAN CHILDREN, RELIEF OF.....	26-27
<i>See also</i> Commission for Relief in Belgium.	
BELGIAN PROFESSORS IN ENGLAND.....	63
BELGIAN RELIEF COMMISSION, <i>see</i> COMMISSION FOR RELIEF IN BELGIUM.	
BELGIUM, <i>see</i> HOOKWORM DISEASE IN MINES.	
BELGIUM, TUBERCULOSIS IN.....	173
BELLO HORIZONTE MEDICAL SCHOOL, RIO DE JANEIRO (STATE):	
Establishment of Department of Pathology	40
Fellowship for training Brazilian pathologists.....	40
BERAUDIÈRE, <i>see</i> FRANCE, <i>under</i> HOOKWORM DISEASE IN MINES.	
BETA-NAPHTHOL IN TREATMENT OF HOOKWORM DISEASE:	
Comparison with oil of chenopodium, thymol, and eucalyptus, with percentage of cures.....	114
BIGGS, DR. HERMANN M.:	
Member International Health Board.....	72
Sent to France to study tuberculosis situation.....	173
BILLINGS, DR. FRANK.....	224
BLACK, DAVIDSON:	
Professor of Embryology and Neurology, Peking Union Med- ical College.....	228
BLOIS, FRANCE.....	176
BOARD OF FOREIGN MISSIONS OF THE METHODIST EPISCOPAL CHURCH:	
Grant by China Medical Board for hospitals in China.....	237

	PAGE
BOARD OF FOREIGN MISSIONS OF THE PRESBYTERIAN CHURCH OF THE U. S. A.:	
Grant by China Medical Board for hospitals in China.....	237
BOGAWANTELAWA, CEYLON.....	105, 146
BOLIVAR COUNTY, MISSISSIPPI, <i>see under</i> MALARIA CONTROL.	
BORDEAUX, FRANCE.....	176
BORING, ALICE M.:	
Assistant in Biology, Pre-Medical School, Peking Union Medical College.....	228
BOUTWELL, L. R.....	240
BRAZIL:	
Medical education and public health.....	39-40, 64
<i>See also</i> Bello Horizonte Medical School, Rio de Janeiro (state); Oswaldo Cruz Institute, Rio de Janeiro (state); University of Sao Paulo, Department of Hygiene.	
BRAZIL, HOOKWORM DISEASE IN:	
Work for control.....	36
Regional, State, and Field Directors, International Health Board.....	73
Rate of infection.....	85
Result of use of oil of chenopodium in treatment.....	114-115
<i>See also</i> Rio de Janeiro (state), Hookworm disease in; Sao Paulo (state), Hookworm Disease in.	
BRAZIL, NORTH COAST OF	41
BRENNBERG, <i>see</i> HUNGARY, <i>under</i> HOOKWORM DISEASE IN MINES.	
BRENT, BISHOP CHARLES H.	42
BRITISH GUIANA, HOOKWORM DISEASE IN:	
State and Field Directors, International Health Board	73
Intensive method of treatment in Peter's Hall district.....	100
Erection of latrines.....	140
General sanitary improvement.....	140, 143
Table showing persons examined, treated, and cured	210
BRITLAND, A. J. D.:	
Pharmacist, Peking Union Medical College.....	228
BROCKMAN, FLETCHER S.:	
Shanghai Medical School:	
Member Board of Trustees.....	222
Incorporating Trustee.....	233
BROWN, ARTHUR J.:	
Member Executive Committee and Member Board of Trus- tees, Peking Union Medical College.....	221
BROWN, N. WORTH.....	240
BULL, DR. CARROL G.:	
Work on toxin of gas bacillus and antigaseous gangrene serum.....	272-273
BUREAU OF MUNICIPAL RESEARCH, NEW YORK CITY.....	64
BURRES, DR. W. T.:	
State Director for Panama, International Health Board	74

<i>Busuanga, see</i> HOSPITAL SHIP FOR PHILIPPINE ISLANDS.	PAGE
BUTTRICK, DR. WALLACE:	
Rockefeller Foundation:	
Member Executive Committee, 1917, 1918.....	8, 9
Member, 1917, 1918.....	8, 9, 55
International Health Board:	
Member.....	72
China Medical Board:	
Absent in Europe.....	61, 244
General Director.....	220
Member, and Member Executive Committee.....	220
Secretary Board of Trustees, Peking Union Medical College.....	221
Member Executive Committee and Member Board of Trustees, Peking Union Medical College.....	221
Secretary Board of Trustees, Shanghai Medical School.....	222, 233
Member Executive Committee and Member Board of Trustees, Shanghai Medical School.....	222
Incorporating Trustee, Shanghai Medical School.....	233
Also.....	43
CAMP AND COMMUNITY WELFARE WORK:	
As educational institution.....	27-28
List of organizations, with table showing appropriations by Rockefeller Foundation.....	28-29
Summary of expenditures.....	63
CAMP COMMUNITY FUND (RECREATION ASSOCIATION) <i>see</i> CAMP AND COMMUNITY WELFARE WORK.	
CANNON, DR. WALTER B.:	
Shanghai Medical School:	
Member Board of Trustees.....	222
Incorporating Trustee.....	233
CARACAS, VENEZUELA.....	198-199
CARIBBEAN SEA, SHORES OF.....	41
CARREL, DR. ALEXIS:	
Work at Compiègne, France.....	252
Director of laboratory at St. Cloud, France.....	279-280
CARREL-DAKIN TREATMENT OF WOUNDS.....	255-257
CARTER, HENRY R.:	
Clinician, Yellow Fever Commission.....	74
CASTOR OIL IN TREATMENT OF HOOKWORM DISEASE.....	115
CAYMAN ISLANDS, HOOKWORM DISEASE IN:	
Infection survey.....	77, 94, 97
CENTRAL AMERICA, HOOKWORM DISEASE IN:	
Rate of infection.....	88
Tables showing persons examined, treated, and cured....	208, 211
CENTRAL MAHE AREA, SEYCHELLES ISLANDS.....	107
CEYLON, HOOKWORM DISEASE IN:	
Latrines erected in Kalutara Province.....	37, 146
Regional, State, and Field Directors, International Health Board.....	73
Rate of infection.....	85
Percentage of cures under intensive method.....	105

CEYLON, HOOKWORM DISEASE IN— <i>Continued</i> :	PAGE
Results of use of oil of chenopodium in treatment	114-115
Post-campaign measures	118-119
Infection brought from Southern India	120
Results of treatment, with table giving reduction in sickness calls	129-131
Compulsory erection of latrines prior to introduction of curative work	145-146
High rate of reinfection in Matale area	146
Cooperation of Government, with table showing proportion of expense borne by International Health Board	165-166
Methods and results of public instruction	165, 167
Cooperation of Singhalese at Panadura	167
Table showing persons examined, treated, and cured	212
CHÂLONS-SUR-MARNE, FRANCE	176
CHAR, DR. GEORGE Y.	242
CHARTRES, FRANCE	175
CHATEAUDUN, FRANCE	176
CHEFOO, SHANTUNG, <i>see</i> MISSIONARY HOSPITALS IN CHINA.	
CHEMISTRY:	
Projected course at War Demonstration Hospital, Rockefeller Institute for Medical Research	269
<i>See also</i> Bacteriology; Tests, Bacteriological and Chemical in Preventing Epidemics.	
CHENG, CHARLES T.	242
CHENOPODIUM, <i>see</i> OIL OF CHENOPODIUM IN TREATMENT OF HOOKWORM DISEASE.	
CHIENGMAI, SIAM	111-112
CHILD HYGIENE, <i>see</i> AMERICAN RED CROSS—CHILDREN'S BUREAU.	
CHILDREN:	
Dosage of oil of chenopodium in treatment for hookworm disease	116
CHILDREN'S BUREAU OF THE AMERICAN RED CROSS, <i>see</i> AMERICAN RED CROSS—CHILDREN'S BUREAU.	
CHILDREN'S COURTS	32
CHINA:	
Junior Field Director, International Health Board	73
<i>See also</i> College of Agriculture and Forestry, Nanking, China; Missionary Hospitals in China; Pinghsiang Colliery, Kiangsi Province, China, <i>under</i> Hookworm Disease in Mines; Yangtse Valley, China.	
CHINA, MEDICAL SCHOOLS IN:	
Appropriations by China Medical Board	235-236
<i>See also</i> names of schools.	
CHINA MEDICAL BOARD:	
Plans for educational survey of existing institutions	45
Work of strengthening and standardizing outside hospitals	46-47
Fellowships and scholarships to medical missionaries	47
Same with lists of beneficiaries and institutions	239, 240, 242-243

CHINA MEDICAL BOARD— <i>Continued</i> :	PAGE
Changes in rules governing officers	61
Resignation of Frederick T. Gates as Vice-Chairman and Member	61
Amount expended	64
Officers	220
Summary of work	223
Appropriations to medical schools in China	235-236
Grants to missionary hospitals	237-238
Grants for translating textbooks on nursing	243
Rates of exchange	243-244
Report of Treasurer	311-325
<i>See also</i> Peking Union Medical College; Shanghai Medical School.	
CHINA MEDICAL MISSIONARY ASSOCIATION	243
COLE, DR.	275
COLLEGE OF AGRICULTURE AND FORESTRY, NANKING, CHINA:	
Investigations in fertilizers	134-135
COLOMIATTI, DR.	81
COLWELL, DR. H. S.:	
State Director for Grenada, International Health Board	74
COMMISSION FOR PREVENTION OF TUBERCULOSIS IN FRANCE:	
Under direction of International Health Board	27, 35-36
Directors	74
Cooperation with French Government	77
Appointed by International Health Board and active operations begun	173-174
Policy and plan of campaign	174-176
Operating through antituberculosis dispensaries	175, 176, 179
Detailed survey of France	176
Cooperation of American Red Cross in establishing antituberculosis dispensaries	176-177
Traveling exhibits	180-183
Amount expended	215
<i>See also</i> Antituberculosis Dispensaries; Traveling Exhibits for Antituberculosis Work in France; Visiting Nurses in France.	
COMMISSION FOR RELIEF IN BELGIUM:	
Amount expended	64
<i>See also</i> Belgian Children, Relief of.	
COMMISSION OF AMERICAN SOCIAL HYGIENE ASSOCIATION, <i>see</i> AMERICAN SOCIAL HYGIENE ASSOCIATION, COMMISSION OF.	
COMMISSION TO THE ORIENT, <i>see</i> INTERNATIONAL HEALTH BOARD—COMMISSION TO THE ORIENT.	
COMMITTEE ON REFERENCE AND COUNSEL OF ANNUAL FOREIGN MISSIONS CONFERENCE OF NORTH AMERICA	65
COMPIÈGNE HOSPITAL, FRANCE:	
Carrel-Dakin method perfected	252, 257
CONNOR, DR. M. E.	
State Director for Georgia, International Health Board	74

CORBEAU AUX BERLEUR, <i>see</i> BELGIUM, <i>under</i> HOOKWORM DISEASE IN MINES.	PAGE
CORO, VENEZUELA.....	199
COSTA RICA, HOOKWORM DISEASE IN:	
State and Field Directors, International Health Board.....	73
Intensive method of treatment, with map showing areas	108, 110
Dispensary method followed by intensive method.....	111
Increase of hemoglobin index following treatment, with tables.....	121-122, 124
Table showing persons examined, treated, and cured	211
COUSLAND, DR. P. B.....	243
COUTANT, DR. A. F.:	
Physician in Charge, Hospital Ship for Philippine Islands....	75
COVINGTON, DR. P. W.:	
Senior State Director for Texas, International Health Board..	74
COWDRY, DR. E. V.:	
Head Department of Anatomy, Peking Union Medical College.....	228
CROSS, DR. C.:	
Senior Field Director for Mississippi, International Health Board.....	74
CROSSETT, ARKANSAS, <i>see under</i> MALARIA CONTROL.	
DAKIN, DR. HENRY D.....	252
<i>See also</i> Carrel-Dakin Treatment of Wounds.	
DARLING, DR. SAMUEL T.:	
Chairman Uncinariasis Commission to Orient.....	75
Director Department of Hygiene, University of Sao Paulo..	200
DASHIELL, LEFFERTS M.:	
Assistant Treasurer Rockefeller Foundation, 1917, 1918.....	8, 9
DEPARTMENT OF HYGIENE, UNIVERSITY OF SAO PAULO <i>see</i> UNIVERSITY OF SAO PAULO, BRAZIL—DEPARTMENT OF HYGIENE.	
DERSHIMER, DR. F. W.:	
State Director for British Guiana, International Health Board.....	73
DICKOYA, CEYLON.....	146
DIETERICH, DR. FREDERICK H.:	
Assistant in Surgery, Peking Union Medical College.....	229
DILLEY, DR. FREDERICK E.:	
Associate in Surgery, Peking Union Medical College.....	228
DISPENSARY AND HOSPITAL SHIP, <i>see</i> HOSPITAL SHIP FOR PHILIPPINE ISLANDS.	
DISPENSARY METHOD IN HOOKWORM CONTROL:	
Details.....	98-99
Development into intensive method.....	111
In Southern States, with table giving reduction of infection	127-129
In Central America.....	note, 208
<i>See also</i> Intensive Method.	
DOLCOATH, <i>see</i> ENGLAND, <i>under</i> HOOKWORM DISEASE IN MINES.	

	PAGE
DREUX, FRANCE.....	175
DUBINI, DR.....	81, 85
DUNLAP, DR. A. M.:	
Associate Professor of Otology, Rhinology, and Laryngology, Peking Union Medical College.....	228
Also.....	240
DUTCH GUIANA, HOOKWORM DISEASE IN:	
Associate State Director, International Health Board.....	74
Rate of infection.....	88
Results of use of oil of chenopodium.....	114-115
Increase of hemoglobin index following treatment, with tables.....	122-123
Ankylostome regulations and erection of latrines.....	143-144
Table showing persons examined, treated, and cured.....	210
Also.....	note, 112
DISSENTERY:	
In Kiln Community, Hancock County, Mississippi.....	137
Serum produced by Department of Animal Pathology, Rocke- feller Institute for Medical Research.....	270, 271, 272, 274
Vaccination against.....	274
EAST, THE:	
Tables showing persons examined for hookworm disease, treated, and cured.....	208, 212
EASTMAN, F. W.:	
Junior Field Director for Ceylon, International Health Board.....	73
ECKFELT, DR. ODD:	
Assistant in Medicine, Peking Union Medical College.....	228
ELIOT, CHARLES W.:	
Rockefeller Foundation:	
Member, 1917, 1918.....	8, 9
Resignation as Member.....	55
EMBREE, EDWIN R.:	
Rockefeller Foundation:	
Secretary, 1917, 1918.....	8, 9, 55
Secretary Executive Committee, 1917, 1918.....	8, 9
China Medical Board:	
Secretary, <i>ex officio</i>	61
Secretary.....	220
International Health Board:	
Secretary.....	72
EMPYEMA:	
Treatment at War Demonstration Hospital, Rockefeller Institute for Medical Research.....	265-266
<i>See also</i> Pneumonia.	
ENGLAND, <i>see</i> HOOKWORM DISEASE IN MINES.	
EUCALYPTUS IN TREATMENT OF HOOKWORM DISEASE:	
Comparison with oil of chenopodium, thymol, and beta-naph- thol, with percentage of cures.....	114

	PAGE
EURE ET LOIRE, DEPARTMENT OF, FRANCE.....	175-176
FACULDADE DE MEDICINA E CIRURGIA, <i>see</i> UNIVERSITY OF SAO PAULO, BRAZIL—DEPARTMENT OF HYGIENE.	
FALCÓN, VENEZUELA.....	199
FAN YUAN-LIEN, MR.....	224
FARRAND, DR. LIVINGSTON:	
Director of Commission for the Prevention of Tuberculosis in France.....	74, 173
FENG, C. T.:	
Assistant in Chemistry, Pre-Medical School, Peking Union Medical College.....	232
FERRELL, DR. JOHN A.:	
Director for United States, International Health Board.....	73
FERTILIZER:	
Human excrement as.....	134-135
<i>See also</i> Sewage Disposal.	
FIELD LABORATORIES.....	280
FIJI ISLANDS, HOOKWORM DISEASE IN:	
Work for control.....	36
State Director, International Health Board.....	74
Rate of infection.....	85
Percentage of cures under intensive method.....	105
Laws against soil contamination.....	note, 112
Use of oil of chenopodium, with percentage of cures.....	114
Infection brought from Southern India.....	120
Table showing persons examined, treated, and cured.....	212
Also.....	38, 106
FLEXNER, DR. SIMON:	
Rockefeller Foundation:	
Member Executive Committee and Member, 1917, 1918 ..	8, 9
International Health Board:	
Member.....	72
China Medical Board:	
Member and Member Executive Committee.....	220
Member Executive Committee and Member Board of Trustees, Peking Union Medical College.....	221
Member Executive Committee and Member Board of Trustees, Shanghai Medical School.....	222
Incorporating Trustee, Shanghai Medical School.....	233
FLOATING DISPENSARY, <i>see</i> HOSPITAL SHIP FOR PHILIPPINE ISLANDS.	
FOLKS, HOMER:	
Representing American Red Cross, Tuberculosis Work in France.....	74
FOREIGN CHRISTIAN MISSIONARY SOCIETY:	
Grant by China Medical Board for hospitals in China.....	237
FORSYTHE, W. A.:	
Senior Field Director for British Guiana, International Health Board.....	73

FOSDICK, HARRY E.:	PAGE
Member Rockefeller Foundation, 1917, 1918	8, 9
FRANCE, <i>see</i> COMMISSION FOR THE PREVENTION OF TUBERCULOSIS IN FRANCE; HOOKWORM DISEASE IN MINES.	
FUKIEN CHRISTIAN UNIVERSITY, CHINA	234
GAGE, NINA D.	240
GANGES RIVER VALLEY, <i>see</i> ASSAM.	
GANGRENE, GASEOUS	
Serum produced by Department of Animal Pathology, Rocke- feller Institute for Medical Research	270-271
As wound infection	272
Discovery of toxin	272
Preparation of serum and demonstration of its value	272-273
Combined serums	273
<i>See also</i> Carrel-Dakin Treatment of Wounds.	
GARDNER, DR. P. B.:	
State Director for St. Vincent, International Health Board . . .	74
GAS BACILLUS INFECTION, <i>see</i> GANGRENE, GASEOUS.	
GASEOUS GANGRENE, <i>see</i> GANGRENE GASEOUS.	
GATES, DR. FREDERICK L.:	
Member China Medical Board	220
Member Board of Trustees, Shanghai Medical School	222
Incorporating Trustee, Shanghai Medical School	233
Studies on vaccination against meningitis	276
GATES, FREDERICK T.:	
Rockefeller Foundation:	
Member, 1917, 1918	8, 9
China Medical Board:	
Resignation as Vice-Chairman and Member	61
International Health Board:	
Member	72
GENERAL EDUCATION BOARD:	
Cooperation in medical education	48
GEORGIA, HOOKWORM DISEASE IN:	
Work for control	36
State Director, International Health Board	74
Also	note, 170
GERMANY, <i>see</i> HOOKWORM DISEASE IN MINES.	
GIBSON, R. MACLEAN	242
GILFILLAN, EMILY:	
Librarian, Peking Union Medical College	228
GOODNOW, PRESIDENT FRANK J.:	
Lecturer on Sanitary and Administrative Law at School of Hygiene and Public Health, Johns Hopkins University . . .	35
Member, China Medical Board	220
GOODRICH, LUTHER C.:	
Instructor in English, Pre-Medical School, Peking Union Medical College	232

GORGAS, SURGEON-GENERAL WILLIAM C.:	PAGE
Delimitation of seed-beds of yellow fever	41
Chairman Yellow Fever Commission to South America	41, 74, 198
Member International Health Board	72
<i>See also Yellow Fever Commission.</i>	
GRAF SCHWERIN, <i>see</i> GERMANY, <i>under</i> HOOKWORM DISEASE IN MINES.	
GRAND CHENIER BIRD REFUGE	65
GRANT, J. S.	240
GREENE, JEROME D.:	
Resignation as Secretary Rockefeller Foundation	55
GREENE, ROGER S.:	
Resident Director in China, and Member China Medical Board	220
Engaged in Red Cross work at Tientsin	244
Granted a furlough	244-245
GRENADA, HOOKWORM DISEASE IN:	
State Director, International Health Board	74
Dispensary method followed by intensive method	111
Table showing persons examined, treated, and cured	210
GREY, DR. ERNEST:	
Professor of Surgery, Peking Union Medical College	228
GRISWOLD, DR. D. M.:	
State Director for Arkansas, International Health Board	73
GUATEMALA, HOOKWORM DISEASE IN:	
Adoption of sanitary laws	37, note 112
State Director, International Health Board	74
Increased number of latrines as result of intensive method of treatment	107-108
Presidential decree regarding latrines	145
Table showing persons examined, treated, and cured	211
GUAYAQUIL:	
Source of yellow fever infection	41
GUIZERAS, DR. JUAN:	
Clinician and General Adviser, Yellow Fever Commission	75
Investigates reports of outbreaks of yellow fever	198-199
GUM ARABIC, IN COMBATING HEMORRHAGE AND SHOCK	278
GUNN, DR. S. M.:	
Associate Director Tuberculosis Work in France	74
HACKER, HENRY P.:	
Member Uncinariasis Commission to Orient	74
HACKETT, DR. L. W.:	
Associate Regional Director, International Health Board	73
HEMOGLOBIN:	
Increase of index following treatment for hookworm disease, with tables	121-124
HEMORRHAGE AND SHOCK:	
Method of combating	277-278

HAMBURG, ARKANSAS, <i>see under</i> MALARIA CONTROL.	PAGE
HAWKINS, F. H.:	
Member Board of Trustees, Peking Union Medical College...	221
HAYES, CHARLES A.....	240
HEISER, DR. VICTOR G.:	
Proposes Hospital Ship for Philippine Islands.....	42
Director for the East, International Health Board.....	73
HELLIWELL, PAUL V.....	240
HEPBURN, A. BARTON:	
Member Finance Committee, and Member Rockefeller Foundation, 1917, 1918.....	8, 9
HILL, R. B.:	
Junior Field Director for Alabama, International Health Board	73
HILTNER, W. G.....	240
HOLLAND, <i>see</i> NETHERLANDS, <i>under</i> HOOKWORM DISEASE IN MINES.	
HOOKWORM DISEASE:	
Discovery by Dubini.....	81, 85
Prevalence among workmen constructing the St. Gotthard tunnel.....	81
Causes and methods of infection.....	82-83, 132
Incidence in military cantonments.....	83
Predisposing cause of pneumonia and other diseases.....	83-84
Cumulative effects.....	84
Prevalence in tropical and sub-tropical countries, with maps showing distribution.....	85-88
Economic significance.....	121
<i>See also</i> Soil Pollution	
HOOKWORM DISEASE, RELIEF AND CONTROL:	
Extension of work.....	36-37
First attempt in mines.....	36-37
Infection surveys.....	89-97
Objectives in treatment.....	113
Comparison of thymol, oil of chenopodium, eucalyptus, and beta-naphthol, with percentage of cures.....	113-114
Recommendations of Uncinariasis Commission to the Orient on dosage of oil of chenopodium.....	114-115
Cases of poisoning in children by use of oil of chenopodium...	116
Post-campaign measures in Ceylon.....	116, 119
Infection during pregnancy.....	120, 121
Treatment on shipboard.....	120-121
Increase of hemoglobin index following treatment, with tables.....	121-124
Educational aspects and method of treatment.....	125-127
Reduction of infection in Southern States, with table....	127-129
Reduction in sickness calls as result of treatment in Ceylon, with table.....	129-131
Curative work preceded by prevention of soil pollution in Ceylon.....	145
Brazil an example of local support.....	57

HOOKWORM DISEASE, RELIEF AND CONTROL— <i>Continued:</i>	PAGE
Tables showing persons examined, treated, and cured, arranged by region, country, and state	208-212
Amount expended	215-216
<i>See also</i> Beta-naphthol in Treatment of Hookworm Disease; Dispensary Method in Hookworm Control; Eucalyptus in Treatment of Hookworm Disease; Intensive Method in Hookworm Control; Oil of Chenopodium, in Treatment of Hookworm Disease; Thymol, in Treatment of Hookworm Disease; Uncinariasis Commission to the Orient; Names of countries and places.	
HOOKWORM DISEASE IN MINES:	
Italy:	
Infection rate	147, 150
Center of infection at Lercara, Sicily	150
France:	
Governmental investigation and infection rate	147, 153
Center of infection at Beraudière (St. Étienne basin)	153
England:	
Infection rate	148, 150
Center of infection at Dolcoath	150
Belgium:	
Infection rate	148, 150, 154
Center of infection at Corbeau aux Berleur	150
Netherlands:	
Infection rate	148, 153, 154
Center of infection at Neuprick	153
Germany:	
Infection rate	148, 150, 153-154
Center of Infection at Graf Schwerin	150
Results of control measures	153-154
Hungary:	
Infection rate	149, 150
Center of infection at Brennbeg	150
Austria:	
Discoverable cases	149
Spain:	
Infection rate	149, 150
Center of infection at Linares	150
Pinghsiang Colliery, Kiangsi Province, China:	
Beginning of work	36-37, 77
Infection survey	89
International Health Board in cooperation with Chinese government	154
Rate of infection, with table	154-155
Method of infection	154-155
Cooperation of mining authorities	156
United States:	
Prevalence	149-150
Measure and results of control	153-154
Countries attempting to control infection	154
HORSES, IN PRODUCTION OF SERUM	270-273

HOSPITAL SHIP FOR PHILIPPINE ISLANDS:	PAGE
Proposed by Bishop Brent and Dr. Heiser.....	42
Financed by International Health Board and Philippine Government.....	42, 78, 204
Equipment and plan of service.....	42-43, 204-205
General significance of experiment.....	43
Staff.....	75, 204-205
HOSPITALS, <i>see</i> MISSIONARY HOSPITALS IN CHINA; ROCKEFELLER INSTITUTE FOR MEDICAL RESEARCH—WAR DEMONSTRATION HOSPITAL.	
HOUGHTON, DR. HENRY S.:	
Acting Dean, Shanghai Medical School.....	45, 233
Acting Director, China Medical Board.....	61, 244
Acting Resident Director, Peking Union Medical College ...	227
Acting Resident Director, China Medical Board.....	245
HOW, GEORGE K.....	242
HOWARD, DR. HARVEY J.:	
Professor and Head of Department of Ophthalmology, Peking Union Medical College.....	228
Also.....	240
HOWARD, DR. HECTOR H.:	
Director for the West Indies, International Health Board....	73
HOWELL, DR. WILLIAM H.:	
Head of Department of Physiology, School of Hygiene and Public Health, Johns Hopkins University.....	35
HSI YIN-DAH.....	242
HSIEH, DR. E. T.....	242
HUGHES, CHARLES E.:	
Member Rockefeller Foundation, 1917, 1918.....	8, 9, 55
HUMAN EXCREMENT, <i>see</i> FERTILIZER; SEWAGE DISPOSAL; SOIL POLLUTION.	
HUNAN-YALE MEDICAL SCHOOL, CHANGSHA, CHINA:	
Appropriations from China Medical Board.....	235
HUMPHREYS, CHARLES J.....	240
HUNGARY, <i>see</i> HOOKWORM DISEASE IN MINES.	
HUNGARY, TUBERCULOSIS IN.....	173
HYDRICK, J. L.:	
Associate State Director, International Health Board.....	73
IGUAPE, SAO PAULO (STATE).....	162
ILHA DO GOVERNADOR, RIO DE JANEIRO (STATE).....	161
IMMUNOLOGY, <i>see</i> SERUMS.	
INDIA, HOOKWORM DISEASE IN:	
Rate of infection.....	85
Infection carried to other countries.....	120
Estimate of financial gain by elimination.....	122, 125
INDIAN RESEARCH FUND ASSOCIATION:	
Investigation in fertilizers.....	134-135

INDUSTRIAL CONDITIONS, STUDY OF:	PAGE
Amount expended.....	65
INFANTILE PARALYSIS:	
Cooperation of Rockefeller Foundation with various agencies for after care.....	32-33
Amount expended.....	64
INSANE AND FEEBLE-MINDED:	
State surveys and appropriations.....	30-31
<i>See also</i> National Committee for Mental Hygiene.	
INTENSIVE METHOD IN HOOKWORM CONTROL:	
Definition and value as type of treatment.....	100
Routine of treatment.....	103-104
Percentage of examinations and cures.....	104-106
Results regarding latrines.....	106-108
Limited areas of operation, illustrated by map of Costa Rica.....	108-110
Prepared for by dispensary method.....	110-111
Distinguishing characteristics and effect on legislation.....	112
In Southern States, with table giving reduction of infection	127-129
Results of survey in Kiln Community, Hancock County, Mis- sissippi, with maps.....	136-139
<i>See also</i> Dispensary Method in Hookworm Control; Names of places.	
INTERNATIONAL HEALTH BOARD:	
Development of definite aims.....	35-36
Assumes charge of Tuberculosis Commission in France.....	35-36
Areas of work.....	36
Résumé of report of Director.....	36-37
First attempted hookworm control in mines.....	36-37, 77
Cooperation of Governments in enacting sanitary laws.....	37
Observations on malaria.....	38-39
Attention to problems of public health.....	39-40
Establishment of Department of Hygiene, University of Sao Paulo, Brazil, and of Department of Pathology, Bello Horizonte Medical School, Rio de Janeiro.....	40
Yellow Fever Commission.....	40-41, 74-75, 78, 198
Amount expended.....	64
Officers and members.....	72
Personnel of staffs.....	73-75
Review of year's work.....	77-78
Reasons for combating hookworm disease.....	125-127
Increasing measure of local support in work of hookworm control.....	157
Appoints Commission for the Prevention of Tuberculosis in France.....	173
Cooperation with University of Sao Paulo for establishment of Department of Hygiene.....	200
Training Brazilian physicians at Johns Hopkins School of Hygiene and Public Health.....	200
Tabular summary of work in relief and control of hookworm disease.....	208-212
Financial statement with tables showing expenditures.....	214-216
Report of Treasurer.....	306-311

INTERNATIONAL HEALTH BOARD— <i>Continued</i> :	PAGE
Also.....	60
See also Commission for Prevention of Tuberculosis in France; Hookworm Disease, Relief and Control; Hookworm Disease in Mines; Hospital Ship for Philippine Islands; Malaria Control; Yellow Fever Commission.	
INTERNATIONAL HEALTH BOARD—COMMISSION TO THE ORIENT:	
Résumé of report.....	38
ITALY, <i>see</i> HOOKWORM DISEASE IN MINES.	
ITALY, TUBERCULOSIS IN.....	173
JACOBS, DR. W. P.:	
Senior Director for Ceylon, International Health Board.....	73
JAMAICA, HOOKWORM DISEASE IN:	
Cooperation of Government and International Health Board for campaign.....	97
See also Cayman Islands.	
JAMES, MARY L.	240
JAVA, HOOKWORM DISEASE IN.....	38
JEWISH CAMP WELFARE, <i>see</i> CAMP AND COMMUNITY WELFARE WORK.	
JOHNS HOPKINS UNIVERSITY—SCHOOL OF HYGIENE AND PUBLIC HEALTH:	
Cost of establishment and maintenance borne by Rockefeller Foundation.....	34
Relation to Johns Hopkins Medical School.....	34
Determination of policies and terms of admission.....	34-35
Organized departments, with Directors.....	34-35
Temporary quarters.....	35
Amount expended.....	64
Training Brazilian physicians.....	200
JOHNSTONE, DR. ERNEST M.:	
Associate in Surgery, Peking Union Medical College.....	228
Also.....	242
JOLO, PHILIPPINE ISLANDS.....	43, 205
JUDSON, PRESIDENT HARRY P.:	
Member Rockefeller Foundation, 1917, 1918.....	8, 9
Member China Medical Board.....	220
JUVENILE DELINQUENCY, <i>see</i> CHILDREN'S COURTS.	
KALUTARA DISTRICT, CEYLON.....	37, 146
KENDRICK, DR. J. F.:	
Associate State Director for Seychelles Islands, International Health Board.....	74
KENTUCKY.....	note, 170
See also United States, <i>under</i> Hookworm Disease in Mines.	
KIANG, DR. PETER C.....	242
KIBLER, DR. W. H.:	
Associate State Director for Dutch Guiana, International Health Board.....	74

KILN COMMUNITY, HANCOCK COUNTY, MISSISSIPPI:	PAGE
Sanitary reform, with plans showing results of survey . . .	136-139
KIRK, ROBERT H.:	
Comptroller Rockefeller Foundation, 1917, 1918	8, 9, 55
KNIGHTS OF COLUMBUS, <i>see</i> CAMP AND COMMUNITY WELFARE WORK.	
KORNS, DR. JOHN H.:	
Associate in Medicine, Peking Union Medical College	229
Also	240
LABORATORIES, <i>see</i> FIELD LABORATORIES.	
LAKE VILLAGE, ARKANSAS, <i>see under</i> MALARIA CONTROL.	
LANE, LIEUT.-COL. CLAYTON:	
Estimate of financial gain resulting from cure of hookworm disease in India	122, 125
LATRINES:	
Erected in Ceylon	37
Increased number as result of intensive method in hookworm control	107-108
Inadequate accommodation in farm houses	133
Study of types	134
Money spent in Southern States on various types	135-136
Results of survey in Kiln Community, Hancock County, Mississippi, with maps	136-139
Erected in British Guiana	140
Erected in Dutch Guiana	143-144
Ordered by presidential decree in Guatemala	145
Stringent laws in Ceylon	145-146
In Southern States	note, 208, 209
See also Sewage disposal.	
LAUBACH, C. A.:	
Junior Field Director for North Carolina, International Health Board	74
LE MANS, FRANCE	176
LEE, CLAUDE M.	240
LENNOX, DR. WILLIAM G.:	
Associate in Medicine, Peking Union Medical College	228
LERCARA, <i>see</i> ITALY, <i>under</i> HOOKWORM DISEASE IN MINES.	
LESHER, C. B.	240
LETTERS OF TRANSMITTAL:	
Letter of President Rockefeller Foundation transmitting annual report	5
Letter of Secretary Rockefeller Foundation transmitting annual report	53
Letter of General Director International Health Board transmitting annual report	69
Letter of General Director China Medical Board transmitting annual report	219
Letter of Director of Laboratories transmitting report of special war activities of the Rockefeller Institute for Medical Research	249

LETTERS OF TRANSMITTAL— <i>Continued</i> :	PAGE
Letter of Treasurer of Rockefeller Foundation transmitting report of financial operations	283
LEWIS, STEPHEN C.	240
LI, DR. T. M.: Associate in Ophthalmology, Peking Union Medical College	228
LIAU, DR. C. C.	242
LINARES, <i>see</i> SPAIN, <i>under</i> HOOKWORM DISEASE IN MINES.	
LIU JUI-HUA, DR.	242
LIYUIN TSAO, DR.	242
LOUISIANA:	
Junior Field Director, International Health Board	74
Also	note, 170
LONDON SCHOOL OF TROPICAL MEDICINE:	
Investigations in fertilizers	134-135
LUCHOWFU, ANHWEI, <i>see</i> MISSIONARY HOSPITALS IN CHINA.	
LYSTER, THEODORE C.: Clinician, Yellow Fever Commission	75
MCCOLLUM, DR. E. V.: Head of Department of Chemistry, School of Hygiene and Public Health, Johns Hopkins University	35
MCCRACKEN, MABEL A.	240
MCKIMMEY, TERESA: Nurse, Hospital Ship for Philippine Islands	75
MCLEAN, DR. FRANKLIN C.: Director, Peking Union Medical College	227-228
Requisitioned by U. S. Government for war service.	229-230
Also	224
MACON, FRANCE.	176
MAGNESIUM SULPHATE IN TREATMENT OF HOOKWORM DISEASE	115
MA KIAM, HSIU-TS 'AI: Instructor in Chinese, Pre-Medical School, Peking Union Medical College.	228
MALARIA:	
Prevalence	38-39
In Kiln Community, Hancock County, Mississippi	137
MALARIA CONTROL:	
Experiments in Arkansas and Mississippi	77
Bolivar County, Mississippi: Cooperation of International Health Board and Mississippi State Department of Health	184-185
Tests by sterilizing human carriers	184-185
Sunflower County, Mississippi	185
Lake Village, Arkansas: Tests by screening	185-186
Cost of screening	186
Rate of infection shown by parasite index	186

MALARIA CONTROL— <i>Continued</i> :	PAGE
Tests with quinine, giving dosage for adults and children	186, 189
Reduction in infection shown by parasite index and cost per capita	189
Crossett, Arkansas:	
Elimination of breeding-places for mosquitoes	189-190
Reduction of infection as shown by parasite index, with table	190-191
Work taken over by community	190, 192
Reduction of physicians' calls and cost per capita, with table showing distribution	192
Amount expended	215-216
Hamburg, Arkansas:	
Preliminary survey, with table showing distribution of infection	192-193
Reduction of physicians' calls	192, 194
Need of synthetic program	194, 197
Amount expended	215-216
MALAY STATES:	
Hookworm infection brought from Southern India	120
Also	38
See also Uncinariasis Commission to Orient.	
MARACAIBO, VENEZUELA	199
MARTINIQUE, WEST INDIES	198
MARYLAND:	
Work by International Health Board for control of hookworm disease	36
Field and State Directors, International Health Board	74
MATALE AREA, CEYLON	119, 146
MEDICAL AND PUBLIC HEALTH EDUCATION:	
Amount expended	215-216
MEDICAL MISSION AUXILIARY OF THE BAPTIST MISSIONARY SOCIETY (ENGLISH):	
Grant by China Medical Board for hospital at Taiyuanfu	237
MENINGITIS:	
Appearance in military organizations	252
Rockefeller Foundation assumes cost of preparation of anti-meningococcic serum	270
Serum produced by Department of Animal Pathology, Rockefeller Institute for Medical Research	270-272
Problem of dealing with carriers	275-276
Serum supplied to camps	276
Studies in vaccination	276
MENTAL HYGIENE, STUDIES AND DEMONSTRATIONS	64
See also National Committee for Mental Hygiene.	
MEYER, ERNST C.:	
Director of Surveys and Exhibits, International Health Board	73
MILLER, F. A.:	
Junior Field Director for Mississippi, International Health Board	74

MILLER, DR. J. A.:	PAGE
Associate Director, Commission for Prevention of Tuberculosis in France.....	74
MILLS, DR. RALPH G.:	
Professor and Head of Department of Pathology, Peking Union Medical College.....	228
MINDANAO, <i>see</i> HOSPITAL SHIP FOR PHILIPPINE ISLANDS.	
MISSIONARY HOSPITALS IN CHINA:	
Grants by China Medical Board.....	237-238
<i>See also</i> Names of missionary organizations.	
MISSISSIPPI:	
Field Directors, International Health Board.....	74
Table showing persons examined for hookworm disease, treated, and cured.....	209
Also.....	note, 170
<i>See also</i> Kiln Community, Hancock County; Bolivar County and Sunflower County, <i>under</i> Malaria Control.	
MISSISSIPPI STATE DEPARTMENT OF HEALTH:	
Cooperates with International Health Board in tests in malaria control.....	184-185
MOLLOY, DR. D. M.:	
Senior State Director for Nicaragua, International Health Board.....	74
MOONEY, WINIFRED.....	243
MOSQUITOES, <i>see</i> MALARIA CONTROL.	
MOTT, JOHN R.:	
Member China Medical Board.....	220
Chairman and Member Board of Trustees, Peking Union Medical College.....	221
MUKDEN, MANCHURIA, <i>see</i> MISSIONARY HOSPITALS IN CHINA.	
MURPHY, STARR J.:	
Rockefeller Foundation:	
Member Finance Committee, 1917.....	8
Member Executive Committee, and Member, 1917, 1918..	8, 9
International Health Board:	
Member.....	72
China Medical Board:	
Member and Member Executive Committee.....	220
Member Executive Committee and Member Board of Trustees, Shanghai Medical School.....	222
Incorporating Trustee, Shanghai Medical School.....	233
MYERS, LOUIS G.:	
Treasurer, Rockefeller Foundation, 1917, 1918.....	8, 9, 55
NANKING, CHINA, <i>see</i> COLLEGE OF AGRICULTURE AND FORESTRY, NANKING, CHINA.	
NANTUNGCHOW, KIANGSU, <i>see</i> MISSIONARY HOSPITALS IN CHINA.	

NATIONAL COMMITTEE FOR MENTAL HYGIENE:	PAGE
Funds furnished by Rockefeller Foundation.....	30-31
Amount expended.....	63
<i>See also</i> Mental Hygiene, Studies and Demonstrations.	
NATIONAL COMMITTEE FOR PREVENTION OF BLINDNESS.....	65
NETHERLANDS, <i>see</i> HOOKWORM DISEASE IN MINES.	
NEUPRICK, <i>see</i> NETHERLANDS, <i>under</i> HOOKWORM DISEASE IN MINES.	
NEVADA, <i>see</i> UNITED STATES, <i>under</i> HOOKWORM DISEASE IN MINES.	
NEW YORK ASSOCIATION FOR IMPROVING THE CONDITION OF THE POOR.....	64
NICARAGUA, HOOKWORM DISEASE IN:	
Senior State Director, International Health Board.....	74
Dispensary method in treatment followed by intensive method	111
Enactment of laws against soil contamination.....	note, 112
Government decree regarding sanitary conditions.....	144
Table showing persons examined, treated, and cured.....	211
NIGERIA:	
Increase of hemoglobin index following treatment for hookworm disease.....	122
NITROLINE.....	135
NOGENT-LE-ROTRON, FRANCE.....	176
NORRIS, DR. W. P.:	
Associate Regional Director for Ceylon, International Health Board.....	73
NORTH, FRANK M.:	
Member Executive Committee and Member Board of Trustees, Peking Union Medical College.....	221
NORTH CAROLINA, HOOKWORM DISEASE IN:	
State and Field Directors, International Health Board.....	74
Enactment of laws against soil contamination.....	note, 112
Three year program, with table showing proportion of expense borne by International Health Board.....	166, 168
Increased state appropriations for public health work.....	170
Table showing persons examined, treated, and cured.....	209
<i>See also</i> United States, <i>under</i> Hookworm Disease in Mines.	
NORWOOD, CEYLON.....	146
NURSES' ASSOCIATION OF CHINA.....	243
OIL OF CHENOPodium IN TREATMENT OF HOOKWORM DISEASE:	
Comparison with thymol, eucalyptus, and beta-naphthol, with percentage of cures.....	114
Dosage recommended by Uncinariasis Commission to the Orient.....	114, 115
Danger of high dosage.....	114, 116
Purgatives to be used.....	115
Analysis of cases of poisoning following treatment.....	116
Effect on children.....	116
Anthelmintic value.....	116

	PAGE
OSGOOD, E. I.....	240
OSWALDO CRUZ INSTITUTE, RIO DE JANEIRO.....	158
OXFORD COMMITTEE FOR ASSISTING BELGIAN PROFESSORS. <i>see</i> BELGIAN PROFESSORS IN ENGLAND.	
PACKARD, CHARLES W.: Instructor in Biology, Pre-Medical School, Peking Union Medical College.....	231-232
PAGE, WALTER H.: Member International Health Board.....	72
PANADURA, CEYLON.....	167
PANAMA, HOOKWORM DISEASE IN: State Director, International Health Board..... Results of use of oil of chenopodium in treatment..... Table showing persons examined, treated, and cured.....	74 114-115 211
PAOTINGFU, CHIH LI, <i>see</i> MISSIONARY HOSPITALS IN CHINA.	
PAPUA, HOOKWORM DISEASE IN: Associate State Director, International Health Board..... Infection survey, with table giving rate..... Organization of permanent health service..... Appropriation by Government for control.....	74 77, 89, 91-93 91, 93 93
PARASITE INDEX IN MALARIA CONTROL.....	186, 189, 190-191
PARIS, 19TH ARONDISSEMENT, <i>see</i> ANTITUBERCULOSIS DISPEN- SARIES.	
PARK, W. H.....	240
PAUL, DR. G. P.: State Director for Fiji Islands, International Health Board...	74
PAYNE, DR. G. C.: State Director for Trinidad, International Health Board.....	74
PEABODY, FRANCIS W.: Member China Medical Board..... Member Board of Trustees, Shanghai Medical School..... Incorporating Trustee, Shanghai Medical School.....	220 222 233
PEARCE, DR. RICHARD M.: Investigation into medical education and public health in South America..... Adviser in Medical Education.....	39-40 75
PEARL, DR. RAYMOND: Head of Department of Biometry and Vital Statistics, School of Hygiene and Public Health, Johns Hopkins University	35
PEKING UNION MEDICAL COLLEGE: Corner-stone laid..... Description of buildings..... Faculty..... Cooperation with other agencies and gifts to hospitals..... Assistance to medical missionaries..... Board of Trustees.....	43, 224 44, 224, 227 44, 227, 229 46 47 221

PEKING UNION MEDICAL COLLEGE—PRE-MEDICAL SCHOOL:	PAGE
Establishment and opening	44
Faculty	44, 228, 231-232
Buildings	230
Requirements for admission and courses offered	230-231
PENNSYLVANIA MEDICAL SCHOOL, <i>see</i> ST. JOHN'S UNIVERSITY, SHANGHAI.	
PERRONCITO, DR. EDUARDO	81
PETER, W. W.	240
PETER'S HALL DISTRICT, BRITISH GUIANA	100
PFEIFFER, A. C.:	
Senior Field Director for Mississippi, International Health Board	74
PHILIPPINE ISLANDS, <i>see</i> HOSPITAL SHIP FOR PHILIPPINE ISLANDS.	
PHYSICIANS' CALLS:	
Reduction in Ceylon, with table giving numbers	129-131
At Crossett, Arkansas	192
At Hamburg, Arkansas, with comparative table	194
<i>See also</i> Malaria Control.	
PINGHSIANG COLLIERY, KIANGSI PROVINCE, CHINA, <i>see</i> HOOK- WORM DISEASE IN MINES.	
PNEUMONIA:	
Incidence in military cantonments and organizations	83, 252
Serum produced by Department of Animal Pathology, Rocke- feller Institute for Medical Research	252, 269-270, 271, 272
Treatment of troops with serum	274-275
Methods of diagnosis and treatment taught at Rockefeller Institute for Medical Research	275
Value of prophylactic vaccination	275
<i>See also</i> Empyema.	
POINCARÉ, PRESIDENT	174
POLIOMYELITIS, <i>see</i> INFANTILE PARALYSIS.	
POLK, ETHEL	240
PRE-MEDICAL SCHOOL, PEKING UNION MEDICAL COLLEGE, <i>see</i> PEKING UNION MEDICAL COLLEGE—PRE-MEDICAL SCHOOL.	
PREGNANCY, HOOKWORM INFECTION DURING	120, 121
PRINCETON, N. J.:	
Stables erected by Rockefeller Institute for Medical Research for serum production	270-271
PSYCHIATRIC CLINIC AT SING SING PRISON:	
Note of first report	31-32
QUEENSLAND, HOOKWORM DISEASE IN:	
Cooperation of Health Department with International Health Board in control	93
QUIMPER, FRANCE	176
QUININE IN TREATMENT OF MALARIA:	
Tests giving dosage for adults and children	186, 189

READ, BERNARD E.:	PAGE
Associate Professor Physiological Chemistry, Peking Union Medical College.....	228-229
Also.....	240
RECREATION ASSOCIATION, <i>see</i> CAMP AND COMMUNITY WELFARE WORK.	
RED CROSS, <i>see</i> AMERICAN RED CROSS.	
REID, JAMES C.:	
Member Board of Trustees, Peking Union Medical College..	221
REINSCH, PAUL S.	224
RICE, J. L.:	
Junior Field Director for Costa Rica, International Health Board.....	73
RIO BONITA, RIO DE JANEIRO (STATE).....	158
RIO DE JANEIRO (STATE), HOOKWORM DISEASE IN:	
Infection survey and infection rate.....	89, 157-158
Enactment of laws against soil contamination.....	note, 112
Cooperation of International Health Board and Government in beginning work.....	157-158
Sanitary ordinances enacted and funds supplied.....	158-159
Rate of infection in Ilha do Governador.....	161
Assistance by Government.....	161-162
ROCKEFELLER, JOHN D.:	
Member Rockefeller Foundation, 1917, 1918.....	8, 9
Relinquishment of right to control certain annual expenditures.....	20, 23, 58, 64
Letter regarding same.....	59
Gifts to Rockefeller Foundation.....	20, 57, 58
Letter accompanying second gift.....	57-58
ROCKEFELLER, JOHN D., JR.:	
Rockefeller Foundation:	
Chairman Board of Trustees, 1917, 1918.....	8, 9, 55
Chairman Finance Committee, 1917, 1918.....	8, 9
Member, 1917, 1918.....	8, 9
China Medical Board:	
Former Chairman.....	61
Member.....	220
Member Board of Trustees, Peking Union Medical College	221
International Health Board:	
Member.....	72
ROCKEFELLER FOUNDATION:	
Officers, members, and committees, 1917, 1918.....	8, 9
Financial resources; limitations and value.....	19-21
Appropriation of principal fund.....	20, 23, 58
Appropriation to American Red Cross.....	21
Receipts, disbursements, and obligations; with table showing same.....	21-22
Rearrangement of stated meetings of Board.....	23, 56
Docket presented to Trustees, December 5, 1917.....	23
Cooperation between Trustees and Executive Committee.....	23-24
Activities compared with those of Government.....	24-25

ROCKEFELLER FOUNDATION—*Continued*:

	PAGE
Characteristic policies and aims.....	25-26
War Relief Commission withdrawn.....	26
Gift to War Council of American Red Cross.....	26
Policy of consolidation with other relief agencies.....	26-27
Antituberculosis campaign.....	27
Gifts to Camp and Community Welfare with table showing distribution.....	28, 29
Investigation of nervous diseases by Dr. Salmon.....	28, 30
Furnishes funds for, and supports program of, National Com- mittee for Mental Hygiene.....	30-31
First report of Psychiatric Clinic at Sing Sing Prison.....	31-32
Work with children's court.....	32
Contributions to after care of infantile paralysis.....	32-33
Establishment and organization of School of Hygiene and Public Health.....	33-35
Work of International Health Board.....	35-43, 60
Work of China Medical Board.....	43-48, 60
Funds for training foreign students in United States.....	47-48
Rockefeller Institute for Medical Research.....	48-49
Cooperation with General Education Board.....	49
Gifts to University of Chicago.....	49
World-wide activities.....	49
Amendment to Constitution and election of officers.....	55, 56
Meetings of Executive Committee.....	57
Alterations in funds.....	57-58
Definition of agencies.....	60
Work with unaffiliated organizations.....	62
Summary of expenditures.....	63-65
Offers cooperation to French Government regarding tubercu- losis.....	173
Appropriations to Rockefeller Institute for Medical Research for war activities.....	251
Support of laboratory at Compiègne Hospital, France.....	257
Assumes cost of preparation of antimentingococcic serum.....	270
Report of Treasurer.....	284-344
Balance sheet: Exhibit A.....	288-289
Receipts and disbursements of income: Exhibit B.....	290-292
Foundation's appropriations: Exhibits C-G.....	293-301
Founder's designations: Exhibit H.....	302-303
Miscellaneous: Exhibit I.....	303-305
International Health Board: Exhibit J.....	306-311
China Medical Board appropriations: Exhibit K.....	311-325
Summary of appropriations and payments: Exhibit L.....	326
Additional appropriations for future years: Exhibit M.....	327
Statements of principal funds: Exhibit N.....	328-329
Land, buildings, and equipment funds: Exhibit O.....	329-330
Transactions relating to invested funds: Exhibit P.....	331-335
Schedule of securities belonging to general funds: Exhibit Q.....	336-343
Schedule of securities belonging to special funds: Exhibit R.....	344
ROCKEFELLER INSTITUTE FOR MEDICAL RESEARCH:	
Need of larger maintenance funds.....	48
Amount expended.....	64

ROCKEFELLER INSTITUTE FOR MEDICAL RESEARCH—*Continued*:

Investigations on types of latrines	134
Special war activities	251-257
Depletion of staff	255
Preparation of serums	270
Methods of pneumonia diagnosis and treatment taught	275
Antimeningococcic serum supplied for camps	276
New drug for treatment of syphilis	276-277

ROCKEFELLER INSTITUTE FOR MEDICAL RESEARCH—DEPARTMENT OF ANIMAL PATHOLOGY:

Production of serums at Princeton, New Jersey	269-272
<i>See also Serums.</i>	

ROCKEFELLER INSTITUTE FOR MEDICAL RESEARCH—WAR DEMONSTRATION HOSPITAL:

Field of service	256-257
First patient received	257
Plan of construction and details of interiors	258-262
Staff and courses of instruction given	262-265
Cases treated, principles followed, and results of treatment	265-266
Bacteriological and chemical research	266-267
Need and training of laboratory workers	267-268
Courses in bacteriology and serology	268-269
<i>See also Carrel-Dakin Treatment of Wounds; Serums; Names of diseases.</i>	

ROCKEFELLER SANITARY COMMISSION 168

ROSE, WICKLIFFE:

Rockefeller Foundation:	
Member Executive Committee and Member, 1917, 1918	8, 9
International Health Board:	
Résumé of report	36
General Director	72, 73
China Medical Board:	
Member and Member Executive Committee	220
Member Board of Trustees, Peking Union Medical College	221

ROSENWALD, JULIUS:

Member Rockefeller Foundation, 1917	8, 55
---	-------

RYERSON, MARTIN A.:

Member Rockefeller Foundation, 1917, 1918	8, 9
---	------

SAGE, EBEN C. 61

ST. CLOUD, FRANCE:.

Laboratory for study of surgical problems	279-280
---	---------

ST. ÉTIENNE, FRANCE 153, 176

ST. GOTTHARD TUNNEL 81

ST. JOHN'S UNIVERSITY, SHANGHAI:

Appropriation from China Medical Board	234-236
Discontinuance of medical work	236

ST. LUCIA, HOOKWORM DISEASE IN:

Table showing persons examined, treated, and cured	210
--	-----

	PAGE
ST. NAZAIRE, FRANCE.....	176
ST. VINCENT, HOOKWORM DISEASE IN:	
State Director, International Health Board.....	74
Percentage of examinations under intensive method.....	104-105
Table showing persons examined, treated, and cured.....	210
SALMON, DR. THOMAS W.:	
Study of nervous diseases in military hospitals.....	28-29
Assumes charge in France of casualties from shell-shock.....	30
Also.....	31
SALVADOR, HOOKWORM DISEASE IN:	
State Director, International Health Board.....	74
Enactment of laws against soil contamination.....	note, 112
Table showing persons examined, treated, and cured.....	211
SALVARSAN IN TREATMENT OF SYPHILIS.....	276-277
SAN GIOVANNELLO, <i>see</i> ITALY, <i>under</i> HOOKWORM DISEASE IN MINES.	
SAN GIOVANNELLO LO BUE, <i>see</i> ITALY, <i>under</i> HOOKWORM DISEASE IN MINES.	
SAO PAULO (STATE) HOOKWORM DISEASE IN:	
Enactment of laws against soil contamination.....	note, 112
Survey begun at Iguape by invitation of Government.....	162
Rate of infection.....	162
Further cooperation of Government, with table showing proportion of expense borne by International Health Board.....	165-166
SAO PAULO, UNIVERSITY OF, <i>see</i> UNIVERSITY OF SAO PAULO, BRAZIL—DEPARTMENT OF HYGIENE.	
SCHAPIRO, DR. LOUIS:	
Senior State Director for Costa Rica, International Health Board.....	73
SCHOOL OF HYGIENE AND PUBLIC HEALTH, <i>see</i> JOHNS HOPKINS UNIVERSITY—SCHOOL OF HYGIENE AND PUBLIC HEALTH.	
SCHULTZ, E. W.:	
Junior Field Director for Louisiana, International Health Board.....	74
SCIENTIFIC RESEARCH IN GOVERNMENTAL PROBLEMS.....	64
SCREENING IN MALARIA CONTROL.....	185-186
SEROLOGY, <i>see</i> SERUMS.	
SERUMS:	
Rockefeller Foundation assumes cost of preparation.....	270
Produced by Department of Animal Pathology, Rockefeller Institute for Medical Research at Princeton, N. J.....	270-272
Quantities produced.....	272
Antigangrene and antitetanic produced in same horse.....	273
<i>See also</i> Names of diseases.	
SEWAGE DISPOSAL:	
Efforts toward solving problem on farms in United States.....	133-135
Commercial appliances for disposal of human excrement.....	135-136
Amount expended in investigation at rural homes.....	215
<i>See also</i> Latrines.	

SEYCHELLES ISLANDS, HOOKWORM DISEASE IN:	PAGE
Work for control.....	36
Rate of infection.....	85
Associate State Director, International Health Board.....	74
Percentage of cures under intensive method.....	105
Increased number of latrines.....	107-108
Enactment of laws against soil contamination.....	note, 112
Use of oil of chenopodium in treatment, with percentage of cures.....	114
Table showing persons examined, treated, and cured.....	212
Adoption of sanitary laws.....	37
SHANGHAI MEDICAL SCHOOL:	
Postponement of plans for building.....	44
Incorporation, appointment of Trustees, and provisional charter.....	45, 233
Acting Dean chosen.....	45
operation with other agencies and gifts to hospitals.....	46
Assistance to medical missionaries.....	47
Board of Trustees.....	222
Charter accepted and by-laws adopted.....	233
Plans for buildings.....	233
Decision regarding preparatory school and appropriations to other schools.....	234
SHELL-SHOCK.....	28, 30
SHOCK, <i>see</i> HEMORRHAGE AND SHOCK.	
SIAM, HOOKWORM DISEASE IN:	
Work for control.....	36
State Director, International Health Board.....	74
Rate of infection.....	85
Work at Bangkok and Chiangmai.....	111-112
Dispensary method in treatment followed by intensive method.....	110-111
Table showing persons examined, treated, and cured.....	212
Also.....	note, 208
SICILY, <i>see</i> ITALY, <i>under</i> HOOKWORM DISEASE IN MINES.	
SICKNESS CALLS, <i>see</i> PHYSICIANS' CALLS.	
SING SING PRISON, NEW YORK, <i>see</i> PSYCHIATRIC CLINIC AT SING SING PRISON.	
SKINNER, J. E.....	240
SMILLIE, DR. W. G.:	
Senior Field Director for Maryland, International Health Board.....	74
Assistant Director, Department of Hygiene, University of Sao Paulo.....	200
SMYLY, DR. H. JOCELYN:	
Associate in Medicine, Peking Union Medical College.....	229
SNODGRASS, DR. J. E.:	
Associate State Director for Ceylon, International Health Board.....	73
SODIUM HYPOCHLORITE AS ANTISEPTIC SOLUTION.....	256, 266
<i>See also</i> Carrel-Dakin Treatment of Wounds.	

SOIL CONTAMINATION:	PAGE
Laws for prevention	note, 112
Necessary to hookworm infection	132
Cause of enteric infections	134
Cause of disease in Kiln Community, Hancock County, Mississippi	136-137
Prevention in Virginia	139
<i>See also</i> Fertilizer.	
SOIL SANITATION, <i>see</i> SEWAGE DISPOSAL.	
SOUTH CAROLINA:	
Enactment of laws against soil contamination	note, 112
Increased state appropriations for public health work	170
SOUTH MAHE AREA, SEYCHELLES ISLANDS	107
SOUTHERN STATES, HOOKWORM DISEASE IN:	
Dispensary method followed by intensive method	111
Reduction of infection following treatment	127, 129
Money spent on latrines	135-136
State appropriations index to public opinion regarding health work, with table showing increase	168-170
Tables showing persons examined, treated, and cured	208-209
<i>See also</i> Names of States.	
SPAIN, <i>see</i> HOOKWORM DISEASE IN MINES.	
SPEER, ROBERT E.:	
Member Executive Committee and Member Board of Trust- ees, Shanghai Medical School	222
Incorporating Trustee, Shanghai Medical School	233
STABLES AT PRINCETON, NEW JERSEY:	
Erected by Rockefeller Institute for Medical Research for serum production	270-271
<i>See also</i> Serums.	
STATE CHARITIES AID ASSOCIATION	32
<i>Stegomyia</i> (MOSQUITO)	198
STIFLER, WILLIAM W.:	
Dean and Instructor in Physics, Pre-Medical School, Peking Union Medical College	231
STRAUSS, FREDERICK:	
Rockefeller Foundation:	
Member, 1917, 1918	8, 9
Member Finance Committee, 1918	9
STRODE, G. K.:	
Associate State Director for Maryland, International Health Board	74
STRUSE, DR. A. M.:	
State Director for Guatemala, International Health Board	74
SULU ARCHIPELAGO, <i>see</i> HOSPITAL SHIP FOR PHILIPPINE ISLANDS.	
SUNFLOWER COUNTY, MISSISSIPPI, <i>see under</i> MALARIA CONTROL.	
SWARTZ, PHILIP A.:	
Director of Religious Work, Peking Union Medical College	228

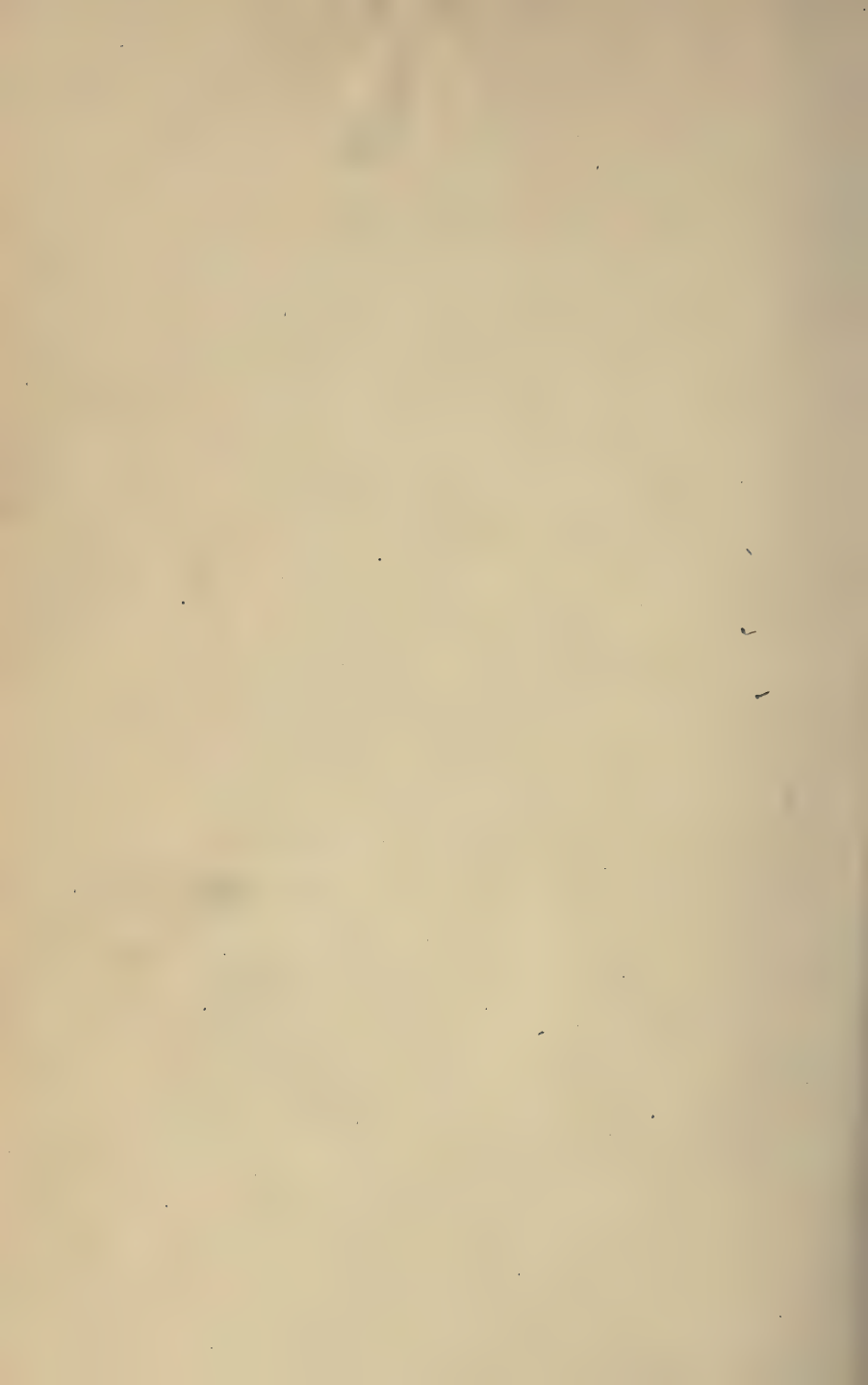
SYPHILIS:	PAGE
Satisfactory action of new drug.....	276-277
SZE, ELIZABETH.....	243
SZE-JEN SHEN, DR.....	242
TAIYUANFU, SHANSI, <i>see</i> MISSIONARY HOSPITALS IN CHINA.	
TAYLOR, DR. ADRIAN S.:	
Professor and Head of Department of Surgery, Peking Union Medical College.....	227
Also.....	240
TAYLOR, DR. H. A.:	
State Director for Arkansas, International Health Board....	73
TAYLOR, R. V.....	242
TEHCHOW, SHANTUNG, <i>see</i> MISSIONARY HOSPITALS IN CHINA.	
TENNESSEE, HOOKWORM DISEASE IN:	
Tables showing persons examined, treated, and cured.....	209
Also.....	note, 170
<i>See also</i> United States, <i>under</i> Hookworm Disease in Mines.	
TESTS, BACTERIOLOGICAL AND CHEMICAL IN PREVENTING EPI-DEMICS.....	266, 267
<i>See also</i> Bacteriology; Chemistry.	
TETANUS:	
Diminishing infection.....	255
Prophylactic use of serum.....	273
Combined serums.....	273
<i>See also</i> Carrel-Dakin Treatment of Wounds.	
TEXAS, HOOKWORM DISEASE IN:	
State and Field Directors, International Health Board.....	74
Table showing persons examined, treated, and cured.....	209
Also.....	note, 170
THOMSON, J. OSCAR.....	240
THYMOL IN TREATMENT OF HOOKWORM DISEASE:	
Comparison with oil of chenopodium, eucalyptus, and beta-naphthol, with percentage of cures.....	113, 114
TIENTSIN, CHIHLI, <i>see</i> MISSIONARY HOSPITALS IN CHINA.	
TILDEN, CHARLES J.:	
Instructor in Sanitary Engineering, School of Hygiene and Public Health, Johns Hopkins University.....	35
TOBAGO, WEST INDIES.....	77, 93-94
TONG, Y. T.:	
Assistant in Physics, Pre-Medical School, Peking Union Medical College.....	228
TOURS, FRANCE.....	176
TRAINING CAMPS, <i>see</i> CAMP AND COMMUNITY WELFARE WORK.	
TRAINING CAMPS COMMISSION, <i>see</i> CAMP AND COMMUNITY WELFARE WORK.	
TRANSLATION INTO CHINESE OF TEXTBOOKS ON MEDICINE AND NURSING.....	243

	PAGE
TRAVELING EXHIBITS FOR ANTITUBERCULOSIS WORK IN FRANCE	183
TRINIDAD, HOOKWORM DISEASE IN:	
State Director, International Health Board	74
Infection survey in Tobago	77, 93-94
Dispensary method in treatment followed by intensive method	111
Governmental efforts to prevent infection from India	120-121
Rate of infection among emigrants	120-121
TROYES, FRANCE	176
TSEN, DR. E. T. H.:	
Associate in Bacteriology, Peking Union Medical College	228
Also	242
TSINANFU UNION MEDICAL COLLEGE, CHINA:	
Appropriation from China Medical Board	235
TSING-LIANG LI, DR.	242
TUBERCULOSIS:	137, 173
<i>See also</i> Commission for the Prevention of Tuberculosis in France.	
TUCKER, F. F.	242
TYPHOID FEVER:	
In Kiln Community, Hancock County, Mississippi	137, 139
Reduction of morbidity in Virginia	139
UNCINARIA, <i>see</i> HOOKWORM DISEASE.	
UNCINARIASIS, <i>see</i> HOOKWORM DISEASE.	
UNCINARIASIS COMMISSION TO ORIENT:	
Personnel	75
Return to America	78
Comparison between thymol, oil of chenopodium, eucalyptus, and beta-naphthol in treatment for hookworm disease, with percentage of cures	114
Recommendations on dosage of oil of chenopodium	114-115
Amount expended	215
UNITED FREE CHURCH OF SCOTLAND:	
Grant by China Medical Board for hospital in Mukden, Manchuria	237
UNITED STATES, <i>see</i> HOOKWORM DISEASE IN MINES.	
UNITED STATES HYGIENIC LABORATORY:	
Investigations in fertilizers	134, 135
UNITED STATES PUBLIC HEALTH SERVICE:	
Tests in malaria control in cooperation with Arkansas State Department of Health and International Health Board	185-186
UNIVERSITY OF CHICAGO:	
Gift from Rockefeller Foundation	48
UNIVERSITY OF SAO PAULO, BRAZIL—DEPARTMENT OF HYGIENE:	
Establishment	40, 78, 200
Quarters provided and work to be inaugurated	203

URUGUAY:	PAGE
Medical education and public health	39-40
VACCINATION:	
Against pneumonia and meningitis	275
VAUGHAN, J. G.	242
VENEZUELA, <i>see</i> YELLOW FEVER; YELLOW FEVER COMMISSION.	
VINCENT, GEORGE E.:	
Rockefeller Foundation:	
President, 1917, 1918	8, 9, 55
Chairman Executive Committee, 1917, 1918	8, 9
Member, 1917, 1918	8, 9, 55
International Health Board:	
Chairman	72
China Medical Board:	
Chairman, ex-officio	61
Chairman	220
Member, and Member Executive Committee	220
Chairman Executive Committee Board of Trustees, Peking Union Medical College	221
Member Board of Trustees, Peking Union Medical College	221
Chairman, and Chairman Executive Committee, Board of Trustees, Shanghai Medical School	222
Member Board of Trustees, Shanghai Medical School	222
Incorporating Trustee, and Chairman Board of Trustees	233
VIRGINIA:	
Reduction of morbidity from typhoid fever	139
Table showing persons examined for hookworm disease, treated, and cured	209
Also	note, 170
VISITEUSE D'HYGIÈNE, <i>see</i> VISITING NURSES IN FRANCE.	
VISITING NURSES IN FRANCE:	
Working agents of Antituberculosis Dispensaries	179
Preparation for service	180
<i>See also</i> Antituberculosis Dispensaries.	
WAITAH WOO, DR. ARTHUR	242
WAITE, DR. J. H.:	
Associate State Director for Papua, International Health Board	74
WAKEFIELD, PAUL	242
WAR DEMONSTRATION HOSPITAL, <i>see</i> ROCKEFELLER INSTITUTE FOR MEDICAL RESEARCH—WAR DEMONSTRATION HOSPITAL.	
WAR RELIEF COMMISSION	26, 61, 63
WASHBURN, DR. B. E.:	
Senior State Director for North Carolina, International Health Board	74
WAY SUNG NEW, DR.:	
Assistant in Surgery, Peking Union Medical College	228
Also	242
WEITZMAN PROCESS, <i>see</i> ACETONE IN AIRCRAFT PRODUCTION.	

	PAGE
WELCH, DR. WILLIAM H.:	
School of Hygiene and Public Health, Johns Hopkins University:	
Director	34
Head of Department of Bacteriology and Immunology ...	35
International Health Board:	
Member	72
China Medical Board:	
Member	220
Member Board of Trustees, Peking Union Medical College	221
Member Board of Trustees, Shanghai Medical School	222
Incorporating Trustee, Shanghai Medical School	233
WEST INDIES, HOOKWORM DISEASE IN:	
Rate of infection	88
Percentage of examinations and of persons left as carriers under intensive method of treatment	105, 106
Infection brought from Southern India	120
Tables showing persons examined, treated, and cured	208, 210
Adoption of sanitary laws	37
<i>See also</i> Names of islands.	
WEST VIRGINIA, <i>see</i> UNITED STATES, <i>under</i> HOOKWORM DISEASE IN MINES.	
WHITMORE, EUGENE R.:	
Pathologist, Yellow Fever Commission	75
WILSON, STANLEY D.:	
Instructor in Chemistry, Pre-Medical School, Peking Union Medical College	231
WINSOR, S. A.:	
Senior Field Director for Ceylon, International Health Board	73
WONG, S. Y.:	
Assistant in Physiological Chemistry, Peking Union Medical College	228
WOO, DR. L. S.	242
WOOD, JOHN W.:	
Member Board of Trustees, Shanghai Medical School	222
Incorporating Trustee and Vice-Chairman Board of Trustees, Shanghai Medical School	233
WOODS, ANDREW H.	242
WOUNDS, SURGICAL TREATMENT OF, <i>see</i> CARREL-DAKIN TREATMENT OF WOUNDS.	
WRIGHTSON, WILLIAM D.:	
Sanitary Engineer, Yellow Fever Commission	75
WU, LILLIAN	243
WUHU, ANHWEI, <i>see</i> MISSIONARY HOSPITALS IN CHINA.	
YALE MOBILE HOSPITAL UNIT	63
YANGTZE VALLEY, CHINA:	
Rate of infection with hookworm disease	85

YELLOW FEVER:	PAGE
Sources of infection	41
Reports of outbreaks investigated by Dr. Juan Guiteras	198-199
Cases at Coro, Venezuela	199
Amount expended in control	215
YELLOW FEVER COMMISSION:	
Personnel	74-75
Surveys in Martinique and Venezuela	78
Visits South America, presents report, and suspends operations	198
YEN, DR. F. C.:	
Junior Field Director for China, International Health Board	73
Also	242
YOH, DR. GRACE	242
YOUNG, DR. CHARLES W.:	
Associate in Medicine, Peking Union Medical College	229
YOUNG KAU, DR. EDWARD	242
YOUNG MEN'S CHRISTIAN ASSOCIATION, <i>see</i> CAMP AND COMMUNITY WELFARE WORK.	
YOUNG WOMEN'S CHRISTIAN ASSOCIATION, <i>see</i> CAMP AND COMMUNITY WELFARE WORK.	
YOUNG'S RULE FOR DOSAGE OF OIL OF CHENOPODIUM	116
ZAMBOANGA, PHILIPPINE ISLANDS	43, 205
ZUCKER, A. E.:	
Instructor in English and German, Pre-Medical School, Peking Union Medical College	228



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1918

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THE ROCKEFELLER FOUNDATION

Annual Report for 1918

CONTENTS

THE ROCKEFELLER FOUNDATION

	PAGE
REPORT OF THE PRESIDENT.....	15
The Year in Brief.....	19
Why Should America Try to Teach France about Tuberculosis?.....	20
Team-Play against Tuberculosis.....	23
Training <i>Les Visiteuses d'Hygiene</i>	25
The Medical "Tank": Its Crew and Its Ammunition.....	27
Turning the System over to the French.....	29
Cheaper to get Rid of Malaria than to Have It.....	31
States Undertaking Malaria Control.....	33
Attacking the Seed-Beds of Yellow Fever.....	35
Progress in Control and Prevention of Hookworm Infection.....	37
Significant Developments in Brazil and Australia.....	39
A New School of Hygiene and Public Health.....	41
Future Plans for Public Health and Medical Education.....	42
The "Green City" in Peking.....	44
Medical Education in China and South America.....	46
International Fellowships and Scholarships.....	48
Aid to Research Institute, Mental Hygiene, Infantile Paralysis.....	49
Studies in Industrial Relations.....	50
A Resume of War-Work Appropriations, 1914-1919.....	52
Finances for 1918.....	56
The Welfare of Mankind Throughout the World.....	58
REPORT OF THE SECRETARY.....	61
Organization and Agencies.....	65
Methods of Carrying Out Work.....	66
Assistance to Other Agencies.....	68
REPORT OF THE TREASURER.....	283

INTERNATIONAL HEALTH BOARD

	PAGE
REPORT OF THE GENERAL DIRECTOR.....	73
General Summary.....	81-110
Control of Yellow Fever.....	83
Significant Developments and Results in Hookworm Control.....	91
Tuberculosis Work in France.....	102
Malaria Control.....	102
Public Health Training.....	104
Publications.....	107
Appendix.....	111-206
Extent and Severity of Hookworm Disease.....	111
Effects of Hookworm Infection.....	121
Diagnosis of Hookworm Infection.....	130
Methods of Treating Hookworm Disease.....	138
Hookworm Infection Surveys.....	148
Hookworm Control Operations.....	153
Soil Sanitation as a Means of Control.....	166
Malaria Control.....	186
Tuberculosis in France.....	201
Tabular Summary.....	207
Financial Statement.....	213

CHINA MEDICAL BOARD

REPORT OF THE GENERAL DIRECTOR.....	219
Peking Union Medical College.....	232
Officers of Administration and Instruction.....	235
Shanghai Medical School.....	249
Other Medical Work Aided.....	250
Fellowships and Scholarships.....	254
Miscellaneous.....	259
Officers of the Board.....	260

ROCKEFELLER INSTITUTE FOR MEDICAL RESEARCH
SPECIAL WAR ACTIVITIES

REPORT OF THE DIRECTOR OF LABORATORIES.....	265
War Work of the Rockefeller Institute for Medical Research.....	269
Instruction at War Demonstration Hospital.....	270
Treatment at War Demonstration Hospital.....	273
Courses in Bacteriology, etc.....	274
Production of Serum.....	274
Anti-gaseous Gangrene Serum.....	278

ILLUSTRATIONS

FIGURE	PAGE
1 World Map of Activities of the Rockefeller Foundation....	18
2 Yellow Fever Commission and Staff in Guayaquil, Ecuador	89
3 Anti-Mosquito Squad and Implements, Yellow Fever Campaign, Guayaquil, Ecuador.....	90
4 Brazilian States Appropriating for Hookworm Work.....	97
5 County Health Rally in North Carolina.....	99
6 Australia and New Guinea, Showing Area of Intensive Work against Hookworm Disease.....	101
7 Model to Demonstrate Malaria Control Operations, De- partment of Hygiene, University of Sao Paulo.....	105
8 Correlation Between Rates of Hookworm Infection and Amount of Rainfall, Texas.....	111
9 Rates of Hookworm Infection by Occupation, Sao Paulo, Brazil.....	112
10 Rates of Hookworm Infection by Age, All Countries.....	113
11 Rates of Hookworm Infection by Race, All Countries.....	114
12 One Means of Acquiring Hookworm Disease, Brazil.....	115
13 Method of Night Soil Disposal in Federated Malay States	116
14 Relationship between Rates of Hookworm Infection and Cures by Two Treatments, Trinidad.....	117
15 Hookworms Harbored by 378 Infected Persons, Java.....	118
16 Comparison of Number of Worms Harbored by Agricul- tural Workers and Dwellers in Mountain Villages, Java and Sumatra.....	119
17 Reduction in Hemoglobin Associated with Hookworm Dis- ease.....	122
18 Increase in Hemoglobin Following Treatment for Hook- worm Disease, All Countries.....	123
19 Javanese. Severely Infected with Hookworm Disease, Be- fore Treatment.....	125
20 Same Patient One Year Later, After Treatment.....	125
21 School Children Applying for Hookworm Treatment in Salvador.....	126
22 Comparative Mental Retardation in Months; 340 School Children of Queensland.....	128
23 Results of Binet-Simon Mental Tests by Age Groups; 340 School Children, Queensland.....	129

24	Special Type of Hand Centrifuge Used in Examining Specimens.....	131
25	Boys of Kampong Bharu, Federated Malay States, Infected with Hookworm Disease.....	133
26	Collection of Feces from Javanese Patients, Dutch Guiana	134
27	Worms Expelled and Cases Cured by Two Treatments of Chenopodium, 82 Brazilian Vagabonds.....	141
28	Method of Computing Knowlton's Index of Efficiency....	146
29	Hookworm Infection Survey Map of Jamaica.....	149
30	Hookworm Infection Map, State of Sao Paulo, Brazil....	150
31	Re-Infection Rates at End of One Year or More, Matale Area, Ceylon.....	155
32	Re-Infection Rates in Ceylon; Relationship Between Length of Time Elapsing Between Treatment and Re-Examination.....	156
33	Re-Infection Rates Among Persons Previously Treated for Hookworm Disease, by Countries.....	157
34	Staff for the Relief and Control of Hookworm Disease in State of Rio de Janeiro, Brazil.....	161
35	Hookworm Cavalry in State of Rio de Janeiro, Brazil....	162
36	Ceylon Tea Estate, Showing Laborers' Quarters in Good Condition. Latrines Appear at Right of Photograph...	171
37	Pit Latrine for Use of 40 Laborers, Plantation, Dutch Guiana.....	172
38	New Concrete Latrine for Public Use, Panama.....	179
39	Placing Frames with Wire Mesh in New Type of Concrete Latrine, Panama.....	180
40	Map of Harrison County, Mississippi, at Beginning of Campaign Against Soil Pollution Diseases.....	182
41	Map of Harrison County, Mississippi, at Close of Campaign Against Soil Pollution Diseases.....	183
42	Record of Malaria Control in Five Arkansas Towns, 1916-1918.....	188
43	Borrow Pit Before Draining, Malaria Control by Anti-Mosquito Measures, Hamburg, Arkansas.....	189
44	Same Borrow Pit After Draining.....	189
45	Drained Swamp, Malaria Control by Anti-Mosquito Measures.....	190
46	Map of Lake Village, Arkansas, Showing Lake Chicot and Main Natural Drainage System, Malaria Control by Anti-Mosquito Measures.....	191
47	Laborers at Work Filling Borrow Pit, Anti-Mosquito Operations, Hamburg, Arkansas.....	195

48	Wide Ditch for Heavy Rains, with "V"-shaped Center for Normal Flow. Anti-Mosquito Measures, Monticello, Arkansas.....	196
49	Tuberculosis Dispensary Organization in Department of Eure-et-Loir, France.....	202
50	Improvising Open-Air Treatment of Tuberculosis, Chartres, France.....	203
51	Waiting-Room of Tuberculosis Clinic at Chartres, France	204
52	Work of Tuberculosis Commission in France to December 31, 1918.....	205
53	Peking Union Medical College	233
54	A Unit of the Peking Union Medical College. One of the Fifteen Buildings Being Erected by the China Medical Board.....	237
55	Construction Staff at Work on a Building of the Peking Union Medical College.....	238
56	Medical Institutions Aided by China Medical Board.....	251
57	Actual Expenditures through 1918 and Pledges for Future Years, for Missionary Hospitals, Medical, and Pre-Medical Schools. China Medical Board.....	253
58	Number of Scholarship and Fellowship Holders, by Years, Since Creation of China Medical Board.....	257

TABLES

War Work Expenditures 1914-1919.....	54-55
Receipts and Disbursements in 1918.....	57
Expenditures of the Rockefeller Foundation for the Year 1918.....	69-71
Summary of Hookworm Work in all Countries.....	208
Summary of Hookworm Work in Southern States.....	209
Summary of Hookworm Work in West Indies.....	210
Summary of Hookworm Work in Central America.....	211
Summary of Hookworm Work in the East.....	212
Expenditures of International Health Board for the Year 1918	215-217
Expenditures of China Medical Board for the Year 1918....	261-263

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1918

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THE ROCKEFELLER FOUNDATION

President's Review

To the Members of the Rockefeller Foundation:
Gentlemen:—

I have the honor to transmit herewith a general review of the work of the Rockefeller Foundation for the period January 1, 1918, to December 31, 1918, together with the detailed reports of the Secretary and the Treasurer of the Foundation, the General Director of the International Health Board, the General Director of the China Medical Board, and the Director of the Rockefeller Institute for Medical Research as regards the special war activities of the Institute that have been supported by the Foundation.

Respectfully yours,

GEORGE E. VINCENT,
President.



Fig. 1.—World map of activities of Rockefeller Foundation

PRESIDENT'S REVIEW

THE YEAR IN BRIEF

During the year 1918 the Rockefeller Foundation, through its own departments and by co-operation with seventeen independent agencies:

1. Extended a campaign against tuberculosis in France;
2. Conducted demonstrations in malaria control in Arkansas and in Mississippi;
3. Helped to check a yellow fever epidemic in Guatemala;
4. Made investigations and surveys and inaugurated measures against the same disease in Ecuador;
5. Continued or began hookworm control and encouraged sanitation in twenty-one foreign states and countries and in twelve states of the Union;
6. Entered into comprehensive co-operation for improved public health organization in Brazil and in Australia;
7. Supported a School of Hygiene and Public Health which was opened in October in connection with Johns Hopkins University;
8. Continued to contribute to various war-work agencies until the total given since 1914 reached nearly \$22,500,000;
9. Pushed forward the construction work on fifteen buildings of a new medical center in Peking;
10. Increased the funds of twenty-four missionary hospitals, medical, and pre-medical schools in China;
11. Co-operated with South American Institutions in establishing certain departments of research and teaching;

12. Maintained sixty-eight fellows and scholars from the United States, China, and Brazil who were studying at American medical schools;
13. Supported studies in mental hygiene;
14. Continued appropriations for the after-care of infantile paralysis cases;
15. Made additional gifts to the Rockefeller Institute for Medical Research;
16. Lent for various services expert members of the Foundation's staff;
17. Brought its studies in industrial relations to an end;
18. Made surveys for the American Red Cross and for the American Social Hygiene Association.

In addition to these more characteristic activities of the Foundation, appropriations in fulfillment of pledges were made to a number of organizations whose work does not lie directly in the fields of public health, medical education, or war service. (For a complete list of appropriations for 1918, see pages 69-71, and the detailed report of the Treasurer.)

WHY SHOULD AMERICA TRY TO TEACH FRANCE ABOUT TUBERCULOSIS?

It may well be asked whether it was not presumptuous for Americans to go crusading against tuberculosis in the land of Louis Pasteur. Was there any justification for sending a Commission overseas, save the fact that France, sorely pressed by war, could spare neither per-

sonnel nor resources for a fight against the white plague? When, in July, 1917, Dr. Livingston Farrand and his colleagues of the Foundation's Commission for the Prevention of Tuberculosis in France reached Paris and began their survey of the field, they found already in existence examples of almost every kind of agency known to modern medicine and public health administration as effective in combating consumption.

French scientific men understood the theory of tuberculosis and the principles which underlie the control of it. In the Leon Bourgeois dispensary in Paris were to be found the essential features of an efficient diagnostic and out-patient clinic: a well-planned and adequately equipped building, the leadership of an expert director, a staff of laboratory and clinical assistants, a group of visiting nurses, a training center for these functionaries, daily sessions for patients, and free public lectures on the nature of the disease and the best ways of guarding against it. In one sense, the Americans had nothing to teach the French about the organization and administration of a tuberculosis dispensary.

Another fundamental institution in the control of tuberculosis is the sanatorium. With respect to this the French had little if anything to learn. For example, the sanatorium at Bligny, thirty miles south of Paris, is said to be

equaled by few and surpassed by only one or two American institutions of this sort. Its tastefully designed fire-proof buildings, situated in spacious and beautiful grounds, afford accommodations to 600 patients. The scientific and other equipment is thoroughly modern. Ample sun porches, pleasant walks, opportunities for simple games and for gardening, are provided. The Director is a recognized specialist who adds to expert knowledge, unusual administrative capacity and a fine devotion to his life work. The daily per capita cost in pre-war days was 3.85 francs; in May, 1918, this had risen to 5.65 francs. Apparently Americans had more to learn than to teach at Bligny.

In the organization of local committees, in relief measures, in issuing literature and in carrying on educational work, in Government provision for tuberculous soldiers, in setting apart hospital beds, and in other ways, much was being done in France when the American Commission arrived. It soon became apparent, however, that these various institutions and activities were few in number, isolated, almost unrelated. In France ideas do not spread rapidly by imitation as they do in the United States. There are few French national organizations which can quickly inform every community of what is being done in every other. The "boosting" spirit is

largely lacking in the Gallic character. Individualism, both personal and of the group or community, is a dominant influence. Thus, there was no efficient, co-operative, centralized organization among French agencies for a united, comprehensive attack on tuberculosis.

TEAM-PLAY AGAINST TUBERCULOSIS

The American contribution, then, has been a demonstration of organized team-play. Only as dispensaries, hospitals, sanatoria, preventoria, open-air schools, home supervision by visiting nurses, relief, extra food, educational campaigns, committees, and government officials are all fitted into a co-operative and unified system, can really effective results be secured. The Commission for the Prevention of Tuberculosis of the Rockefeller Foundation and the Tuberculosis Bureau of the American Red Cross set themselves the task of demonstrating to the French people the possibilities of such team-play. In their own relations these two organizations afforded a striking example of the thing they urged upon others. The Nineteenth Arrondissement in Paris and the Department of Eure-et-Loir of the provinces were selected for intensive organization of the essential agencies of tuberculosis control.

Four dispensaries were planned for the Arrondissement, three of these being opened and in operation before the end of 1918. Groups of nurses, or *visiteuses d'hygiene*, attached to these centers visited patients in their homes. The Red Cross provided extra hospital wards, opened sanatoria and preventoria in the suburbs, and supplied food and clothing to needy sufferers from tuberculosis. Thus, elements relatively ineffective when isolated were combined into a mutually re-enforcing co-operation. As it turned out, the undertaking did more than demonstrate the possibilities of public health progress. During the dark days of April, May, and June, 1918, when air-raids were frequent and the long-range gun was dropping many shells in the Nineteenth Arrondissement, the French and American nurses went their daily rounds, calm, cheerful symbols of normality and quiet courage among the panic-stricken workers and the harassed refugees who crowded that quarter of Paris. These noble women did much to combat tuberculosis, but they did infinitely more to dispel fear and to maintain morale.

During 1918 four central dispensaries and six secondary centers were opened in the Department of Eure-et-Loir. Another six were nearly completed, and seven others were located for future development. It is expected that by

July, 1919, the twenty-three called for in the program will be in operation. In the chief towns the French have set aside hospital beds for the use of the Commission, a sanatorium is being prepared near Dreux, and a day camp is available north of Chateaudun. The French authorities and the local committees are co-operating heartily in securing facilities, and as the Red Cross withdraws will assume increasing responsibility for relief work, the provision of extra food, etc. A systematic campaign of education has been carried on throughout the area, so that no family, however remote, has been wholly untouched by this attempt to organize a typical provincial department for a public health crusade. In increasing numbers, public officials and committee representatives from all parts of France are visiting Paris and Eure-et-Loir to see what American methods are accomplishing in actual operation.

TRAINING LES VISITEUSES D'HYGIENE

When the Commission was organized in 1917, one of the problems was to find public health nurses who were familiar with tuberculosis work and who could speak French fluently. Fortunately, a group of exceptionally able and loyal American nurses was secured. Their services

have contributed in a notable way to the success of the undertaking. But it was soon evident that reliance must more and more be placed upon the training of a French personnel. One of the first tasks, therefore, was to provide centers in Paris in which could be organized special courses consisting of lectures, clinics, hospital and sanatorium experience, and field work in visiting patients in their homes. French and American physicians were engaged as instructors, opportunities of the essential kind were secured, and *bourses*, or scholarships, of 150 francs per month, were offered. French women of a satisfactory type responded in gratifying numbers. About seventy were enrolled by the spring of 1918. At the end of the year, forty-five nurses were in the service of the Commission and fifty-six others were in training—forty-five in three centers and four dispensaries in Paris, seven at a new school in Bordeaux, and four in Lyons. An additional training center had been opened in Nantes. All of the fifty-six pupil nurses were receiving scholarships from the Commission. With the organization of local committees throughout France the demand for *visiteuses d'hygiene* is growing. Training centers on the model of those in Paris are likely to multiply in the near future. It is worth noting that the Commission did not seek to attract French nurses by offering them higher

salaries than they had been accustomed to receive from various other institutions and societies. Instead, it used its good offices with the other agencies to have each of them increase its salary scale for nurses. In this way the different organizations gave an effective example of team-play.

THE MEDICINAL "TANK": ITS CREW AND ITS AMMUNITION

"Do you know the Medicinal Tank?" asks a writer in *Le Matin* of November 30, 1918. "It is an invention of the Rockefeller Foundation. This tank rolls over the roads of France, bearing signboards. . . . Behold this tank entering a city—or a village. It does not come unannounced . . . a delegate arrives. He pays visits to all the newspapers and to the municipal, military, prefectoral, and religious authorities. . . . The Mayor offers a free hall to the impresario—I mean the delegate. After the hall has been obtained the delegate covers the city with posters. And such posters! Barnum and Bailey would not be ashamed of them. . . . The legends and designs make people laugh. They gather in a circle, they are amused, and—instructed.

"In the meantime a train at the station discharges a gentleman lecturer and a lady lecturer. These are accompanied by another lady, the 'demonstrator,' whose task it is to comment on the posters in the exposition room. Finally the automobile truck appears.

"The directors of the 'International Department of Hygiene' of the Rockefeller Foundation are aware that

even the best article does not sell unless you 'hit the nail on the head.' Possessors of that excellent though neglected commodity known as truth, they find that public education is necessary in spreading it, and that this, after all, consists in nothing more than applying the art of advertising to the facts of science. This is their harangue brought to us by posters and cinema:

"'No one, O Frenchmen, has excelled you in the scientific study of tuberculosis. But it is not enough that your scientists combat this disease; each one of you must take part in the battle, must benefit from the knowledge acquired, and perform in his turn the office of educator. . . . Why do you give your patronage to charlatans? Because they advertise. We have taken advertising away from them and use it in the interests of science. You think of tuberculosis only after you have it. We are going to make you think of it all the time so that you may protect yourself against its invasion. . . . This way, this way, follow the crowd. . . . We put medicine within the reach of little children. This way, this way, tell us what you prefer, moving pictures or the hospital. Our show saves you from the hospital. We are advertising public health.' "

There is little to add to this clever description of the educational campaign of the Commission. During 1918 three traveling exhibits and groups of lecturers visited ten departments, and in 141 towns of 3,000 or more population gave 875 lectures with demonstrations and exhibits. In the same period 2,115,708 pieces of printed matter, posters, pamphlets, post-cards, and games, were

widely distributed throughout the whole of France. A series of twenty-four articles on tuberculosis appeared in thirty-three important provincial newspapers. The Commission's publicity material, written by French men and women, and charmingly illustrated by French artists, has set a new standard for popular public health education.

TURNING THE SYSTEM OVER TO THE FRENCH

A campaign of extension has reached twenty-seven departments. Representatives of the Commission and of the American Red Cross have visited leading towns and cities in a systematic effort to organize local committees and to induce these groups to establish dispensaries as the first step toward a complete plan for the control of tuberculosis. In the twenty-seven departments, at the time of the first visit, twenty-one dispensaries were already in existence. By the end of the year fifty-seven new dispensaries had been opened, twenty other dispensaries were in process of installation, and plans for forty-nine more had been definitely made. Besides these dispensaries, fifteen laboratories were arranged for, thirty-eight new nurses installed, and forty-two new and active committees organized. It is important to remember that almost all of the

expense, not only for the creation but for the maintenance of these activities, is borne by the French themselves. Plans are on foot for the establishment by the French of a complete system of dispensaries for the Region du Nord, which comprises the five departments recently re-occupied by the Allies and restored to France. Urgent requests are coming from many parts of the country for co-operation in organizing tuberculosis work.

Allusion has already been made to progress in the training of French nurses. It is equally gratifying to report that physicians are showing a keen and intelligent interest in the plans of the Commission. Arrangements have been made to bring a group of these men to the United States, and to afford them an opportunity to observe American institutions and methods. It is expected that in this way leadership will be provided for the assumption in France of rapidly increasing responsibility for the campaign. Local societies and committees which have co-operated so cordially with the Commission are apparently ready to do their part, while government officials have expressed the hope that a new ministry of health may be created which will take over the central supervision of the machinery that is being set up. Within a reasonable time, therefore, the Foundation expects to

withdraw, confident that the work will go on until a nation-wide system for combating tuberculosis has become a permanent part of the policy of France.

CHEAPER TO GET RID OF MALARIA THAN TO HAVE IT

The demonstrations begun in 1916 to test the possibilities of ridding a community of malaria, were continued during 1918. In four towns in Arkansas, anti-mosquito measures were carried out with marked success. By draining or filling pools, by ditching sluggish streams, and by oiling surface water which could not be otherwise dealt with, the breeding of the anopheles (malaria-carrying) mosquito was almost wholly prevented. Thus the sole means by which malaria can be transmitted was eliminated. The results, as tested by the number of calls made by physicians on persons who were suffering from the disease, were striking. In Hamburg, Arkansas, the number of calls fell from 2,312 in 1916 to 259 in 1917, and to 59 in 1918, a reduction for the period of 97.4 per cent. The per capita cost for 1917 was \$1.45; for 1918 it was only 44 cents. In four other communities the percentage of reduction varied from 94.8 per cent to 78.4 per cent, while the per capita costs ranged from \$1.25 to 46

cents. In the computation of per capita costs the overhead expenses of supervision by representatives of the Board have not been included. One could not ask for more convincing proofs that a community may rid itself of malaria on terms which cannot be wisely rejected. It is not surprising that towns and villages are making appropriations faster than trained sanitarians can be found to undertake the work of malaria control.

There are regions in which the anti-mosquito program cannot be successfully carried out because surface waters cannot be controlled. In such cases another method of attack must be adopted: the individuals who harbor malaria germs in their blood must be discovered and treated. In Sunflower County, Mississippi, the Foundation's International Health Board, guided by previous experiments in another county in the same state, undertook a demonstration which aimed at curing the "carriers" of malaria. In this way the mosquito was given no opportunity to receive the infective organism, and therefore no opportunity to transmit it to others. It is believed that in the rural area a malaria control of 80 per cent was secured. For the whole region of about 100 square miles, with a population of 1,000 in the town and 8,000 on the plantations in the country, a large measure of control

was brought about at an initial per capita cost of \$1.08. The manager of one plantation, which has a tenant population of 600, estimates that for the past ten years the doctors' bills for malaria in this group have averaged \$3,000 per year, or \$5 per capita. But, of course, doctors' bills are the least of the items in the total cost of malaria to a community. These demonstrations have left no room for doubt. Malaria elimination is feasible, scientifically and economically; it represents a striking contribution to community progress and human happiness.

STATES UNDERTAKING MALARIA CONTROL

A constant aim of the International Health Board is to turn over to government agencies, public health activities which have been demonstrated to be effective. The anti-malaria campaigns in Arkansas and Mississippi, following an initial experiment begun under the auspices of the U. S. Public Health Service, have been carried out in closest co-operation with the Health Boards of these states. It is a source of satisfaction that the state authorities in Arkansas have decided to create a special division to deal with malaria control. The Legislature has before it a bill which sanctions this arrangement and provides public funds for co-operation with

communities throughout the state in a concerted movement to rid the entire commonwealth of malaria. The measures of control will be based upon the demonstrations conducted under the auspices of the International Health Board, and also upon the results which the U. S. Public Health Service has secured in sanitating, on a large scale, the zones surrounding certain of the army cantonments and camps.

A forward movement is also under way in Mississippi. In 1919 the demonstration described above will be extended to the whole of Sunflower County, which will bear one-half the expense. The State Board of Health is deeply interested and is carrying on the work under its own auspices. If the large-scale experiment proves successful, there is every reason to expect that in the early future the state will assume entire responsibility for a state-wide and persistent effort to eliminate malaria. Among the significant features of the enlarged plans for the Sunflower County demonstration are striking posters, popularly written and illustrated pamphlets, newspaper articles, instruction in the schools, public lectures, and the sale of standardized quinine at low rates by all druggists. It has even been suggested that all individuals who are found free from malaria germs be given buttons as badges of immunity.

ATTACKING THE SEED-BEDS OF YELLOW FEVER

General William C. Gorgas, on his retirement from the office of Surgeon General of the United States Army, in November, 1918, became Director of the Yellow Fever Work of the International Health Board, with freedom to carry out the recommendations of the Special Yellow Fever Commission of which, in 1916, he was the chief. The program called for the determination of the seed-beds of yellow fever, and for systematic attempts to destroy the disease at its sources. To this work General Gorgas immediately addressed himself. Before the end of 1918 he had set out upon a preliminary journey to Central America.

A yellow fever epidemic was reported in Guatemala in June, 1918. In view of the large concentrations of United States troops near Southern ports, the existence of an uncontrolled epidemic so near the border was regarded by the Surgeon General of the Army and by the United States Public Health Service as a menace calling for energetic measures. After consultation with the Guatemalan Minister in Washington, the International Health Board tendered its services to the President of the Republic, and offered to send a competent medical officer, with funds, to co-

operate in bringing the epidemic under control. This offer was promptly accepted, and on July 11, 1918, Dr. Joseph H. White, released from the Army and granted leave by the Public Health Service, sailed for Guatemala. He was cordially received, granted full authority, and given necessary aid. Quarantine was established, physicians were drafted into service, and all well-tested measures for the control of yellow fever were promptly put into effect. The epidemic was brought under control, so that when, on September 19, the expiration of his leave compelled Dr. White to return, infection was left at only one point. The resident representative of the Board took charge and continued appropriate measures. On December 4 he reported that no yellow fever remained in Guatemala.

The diagnosis of yellow fever is a difficult task. Some of the symptoms closely resemble those of other diseases, notably infectious jaundice. The germ of yellow fever has never been identified, so that laboratory tests cannot be used to determine the presence of the malady. In order that first-hand studies and investigations might be made in the field, a commission of five men, with laboratory equipment, was sent to Guayaquil, Ecuador, in June, 1918, for a stay of two months. As a result of this trip, important information was secured with respect to the sanitary conditions

in Ecuador and concerning the bacteriological, chemical, and clinical aspects of yellow fever.

Measures for the control of yellow fever in the city of Guayaquil were actively inaugurated on November 27, 1918. These measures are being conducted with the hearty co-operation of the Government of Ecuador and of the municipality. The attack is being directed against the *stegomyia* mosquito by which alone yellow fever can be communicated. At the end of December, 125 men, divided into squads of five men each, were systematically at work in the city of Guayaquil. It is hoped that measurable results in the reduction of infection will be disclosed in the near future. Yellow fever is being pressed further and further into isolated areas. This seems to be one disease which by persistent activity may be brought completely under control.

PROGRESS IN CONTROL AND PREVENTION OF HOOKWORM INFECTION

By far the most extensive work of the International Health Board has to do with this intestinal infection, which prevails in almost all tropical and semi-tropical lands, in the Southern States of America, and in the mining districts of several European countries. The policy of the Board is to work only in co-operation with

Governments, and to turn the undertaking over to public control as soon as possible after a successful demonstration has been made. The usual program of procedure includes: (1) an infection survey to determine the prevalence of the disease; (2) an intensive demonstration of treatment to cure the victims of the malady, together with (3) a campaign of popular education as to the nature, control, and prevention of hookworm disease; and (4) a persistent effort to secure the provision of proper sanitary facilities and regulations by which alone the pollution of the soil and the re-infection of the population can be avoided.

Work for the relief and control of hookworm disease was conducted during 1918 in co-operation with twelve states in the United States and with twenty-one foreign states and countries. Infection surveys were completed in the State of Sao Paulo, Brazil, in Jamaica, and in Guam. New work was undertaken in Queensland, Australia, and in Minas Geraes, Brazil. Of several invitations to begin new co-operative work it was possible to accept only one, that of the Madras Government of India. As a result of the demonstrations of the Board, a number of Governments, quite on their own account, have inaugurated hookworm control measures. In Ceylon, gratifying progress is reported in hookworm control, in sanitation, and in the training of a

native medical staff. Siam is planning to extend its work and to increase appropriations. The survey of the United States Pacific Island of Guam disclosed an infection of 71 per cent, but of a mild type. Jamaica, after a survey, has undertaken appropriate measures. Distinct advances in sanitation and the compulsory installation of latrines were reported from Ceylon, Queensland, Brazil, the Seychelles Islands, Siam, the West Indies. The control and sanitary program being carried out in the Pinghsiang Colliery in China is a most encouraging evidence of what a carefully conducted demonstration can accomplish.

SIGNIFICANT DEVELOPMENTS IN BRAZIL AND AUSTRALIA

While the relief of large populations from the limitations and suffering which are consequent upon hookworm disease is in itself a highly important aim, the International Health Board has always regarded its hookworm demonstrations as a means to an even larger end, namely, the establishment of inclusive Public Health Services capable of dealing with all aspects of public health for a community, a state, or a nation. For this reason, two developments during 1918 have been welcomed with especial satisfaction.

Several of the states of Brazil have taken up hookworm campaigns energetically in co-operation with the Board. The movement has gained momentum because the Federal Government has made large appropriations for subsidizing the efforts of the various states. In order to further this nation-wide program, the International Health Board has largely increased its contributions, and has lent a specialist to make, under Federal auspices, a survey of rural health problems for the whole of Brazil. The bearing of all this upon the development of public health administration in that country is obvious.

A hookworm survey of Papua and of a region in Queensland has led to unexpected developments. The authorities, both of Queensland and of the Federal Government of Australia, have shown deep interest. They have proposed a five-year period of co-operation in carrying out for Queensland and for Papua a program of rural sanitation in which hookworm control is to play a leading, but not an exclusive, rôle. The Board will contribute the services of an expert sanitarian and appropriate a fairly large annual sum at the outset. This will decrease by 20 per cent annually, until at the end of the period the entire expense will be borne by Australia.

A NEW SCHOOL OF HYGIENE AND PUBLIC HEALTH

In October, 1918, the School of Hygiene and Public Health, made possible by gifts from the Rockefeller Foundation for building, equipment, and maintenance, was opened under the auspices of Johns Hopkins University in Baltimore. A former physics laboratory, temporarily prepared for the purpose, afforded reasonably satisfactory quarters. The erection of a permanent building is contemplated in the early future. Because of war conditions the initial enrolment was not large. Seventeen students were in attendance during the first semester. It is expected that the number will rapidly increase. The demand for public health functionaries has been stimulated by the war and by the prospective needs of peace. The Foundation's interest in preventive medicine and the conviction that a trained personnel is an essential condition of progress have led to the establishment of this institution.

The new school will not only provide thorough courses in the fundamental chemical, biological, and medical subjects in their many specialized phases, but will lay stress upon vital statistics, upon sanitary engineering, upon the sociological aspects of public health, upon community surveys, and upon the technique of administration.

It is significant of the new attitude of preventive medicine that from the outset attention is being given to the problems of nutrition. It is proposed to work out basic standards of food for human beings under various conditions. Prevention is being more and more positively interpreted into a better standard of living, in terms of working conditions, housing, food, exercise, recreation, sociability, and happiness. The field of industrial hygiene has great possibilities. Studies of fatigue, of occupational diseases, of light and ventilation, of medical care of employees, etc., are opening new vistas.

FUTURE PLANS FOR PUBLIC HEALTH AND MEDICAL EDUCATION

The past activities of the Foundation, including certain war-time experiences, have led, during the year, to the consideration of plans and policies for the future. The coming of physicians and medical students from Brazil, from China, from France, on Foundation fellowships, to pursue courses in leading medical schools of the United States, and the necessity of furnishing accurate information to these men and women, have suggested the importance of gathering data with respect to the personnel, equipment, and resources of such American institutions.

Successful demonstrations with hookworm and malaria have raised the question as to whether more comprehensive surveys and programs may not be carried out in co-operation with local officials and voluntary societies in typical urban and rural communities.

Significant progress in such undertakings is reported from North Carolina. In nine counties, three-year programs have been inaugurated which make definite attacks upon the more important public health problems, such as soil pollution and its attendant diseases, typhoid fever, infant diarrhea, dysentery, and hookworm. The medical inspection and treatment of school children, the quarantine of infectious diseases, the prevention of tuberculosis, and work for infant welfare, are also included in the plan, which is supported by the combined contributions of the State, the counties, and the International Health Board. The administration of these campaigns is unified under the leadership of the State Board of Health. Several other counties have undertaken similar programs on their own initiative.

The problem of the functions and the appropriate training of the public health nurse has been raised by a number of applications for Foundation aid. It was deemed wise to call a conference of the leading groups which are con-

cerned with this question. As a result of such a meeting, held in December, 1918, a special committee was appointed to study the situation and to make recommendations. In view of the Foundation's special concern with the field of preventive medicine, it has been decided systematically to collect information about public health organization and procedure in the leading countries of the world. It is proposed gradually to extend the policy already begun in Brazil,—of helping to establish new departments or of strengthening existing courses in public health and medicine in certain universities in countries where the Foundation is at work. Another plan is to attach to the central staff of the International Health Board, one or more trained public health laboratory experts whose services may be put at the disposal of state or municipal boards of health which desire aid in extending and improving their public laboratory service.

THE "GREEN CITY" IN PEKING

Work on the fifteen buildings of the Peking Union Medical College, which are being constructed under the auspices of the China Medical Board of the Rockefeller Foundation, has gone steadily forward during 1918. There have been inevitable delays due to difficulty in securing

materials from the United States. Costs have increased enormously, not only because of war prices, but by reason of most unfavorable rates of exchange. Nevertheless the progress has been encouraging. The Chinese laborers take kindly to American building methods. The re-enforced concrete construction which was employed was a welcome novelty. The use of woodworking machinery has aroused much interest. The turning out of uniform sash, doors, window frames, etc., was a new idea to a people accustomed to hand work, whose nearest synonym for identical is "not so very different." Because glazed green tiles are being used to cover the high Chinese-like roofs of the new buildings, the people have already named the group "The Green City."

The pre-medical school which opened in 1917 with eight pupils, increased its enrolment in 1918 to seventeen. The quality of these students is reported to be exceptionally promising. Additions to the faculty of the medical school were made during the year, until, by the end of December, thirty-four men and women were under appointment to the staff proper. Of these, twenty-three were already in Peking. In addition, a number of lesser appointments have been made. Laboratory facilities will be available for work in the autumn of 1919, but the new

hospital wards probably will not be ready until a year later. Meantime an old hospital of limited capacity is being operated. Before the end of 1920 it is hoped that the new plant will be finished, and that the work of the most completely equipped and adequately manned center of medical research and teaching in China will be auspiciously under way.

MEDICAL EDUCATION IN CHINA AND SOUTH AMERICA

The program of the China Medical Board includes, in addition to the Peking medical center, another at Shanghai. The building of this has been deferred for a time because of war conditions and high costs of construction. The Board during 1918 gave aid to three medical schools and to nineteen hospitals which are conducted in China under the auspices of several missionary boards. In this way a total sum of \$181,235 was expended. The purpose of these appropriations was to strengthen teaching centers and to provide better equipment and a larger personnel for hospitals. It has seemed wise, during the period preceding the opening of the new medical school at Peking, to co-operate with a considerable number of institutions, but it is probable that in the future the China Medical Board will adopt the

policy of concentrating its subsidies upon a few significant and strategic centers. The best educational opportunities can be provided only in places where clinical facilities are abundant and varied, and where a sufficiently large staff permits the requisite specialization. Facilities will be offered in this way not only for native students to secure fundamental training, but for medical missionaries to keep abreast of the advances in science and technique through frequent, even though brief, periods of resident study.

It seems a long way from Peking to Sao Paulo, Brazil, but the commonwealth of science knows no national boundaries and ignores distances. In March, 1918, a new Department of Hygiene was opened in connection with the *Faculdade de Medicina e Cirurgia* at Sao Paulo. The International Health Board has lent two American scientists to this school for a period of five years. It has also provided scholarships for two Brazilian physicians who, during this time, are to receive special training at schools of medicine and public health in America, with a view to their taking over the new department in Brazil. A somewhat similar arrangement made with the Oswaldo Cruz Institute for introducing a department of pathology, has been carried through successfully. Because of its interest in medical progress in South America, the Foundation has also agreed

to underwrite, for a five-year period, half of a specified deficit which may attend the printing and the circulation in Central and South America of a Spanish edition of the *Journal of the American Medical Association*.

INTERNATIONAL FELLOWSHIPS AND SCHOLARSHIPS

Frequent allusions have been made to fellowships and scholarships which are granted to students from foreign countries or to American missionaries at home on furlough. Since 1915 it has been the policy of the Foundation to bestow study stipends of this kind. In 1918 a total of \$55,000 was expended for this purpose. There were sixty-eight fellowships and scholarships distributed as follows: Brazilian physicians three, Chinese graduate physicians eleven, Chinese undergraduate medical students (formerly students of the Harvard Medical School of China) ten, Chinese pharmacists three, Chinese nurses six, medical missionaries on furlough twenty-six, candidates under consideration for the new schools at Peking and Shanghai nine. Provision was also made for bringing French physicians to the United States for special training in anti-tuberculosis measures, but no actual appointments were made in 1918. The International Health Board has adopted a system of

"study leave," by which members of its staff of medical officers, now nearly sixty in number, may pursue special courses in public health at leading American or foreign institutions, at the expense of the Board and under favorable conditions of salary. In this way the equivalent of additional graduate fellowships has been created. Furthermore, the Foundation gave assurances to the School of Hygiene and Public Health at Johns Hopkins and to the Rockefeller Institute for Medical Research, that additional appropriations would be considered if special fellowships should be needed for unusually promising men who, on being discharged from the army, preferred public health careers to a return to private practice. A study of the public health and medical education fields makes it clear that a largely augmented personnel of well-trained and experienced experts is a first requisite. The wise provision of stipends for the training of such persons is a fundamental contribution to progress in each nation, and may be made a means of promoting international understanding and good will.

AID TO RESEARCH INSTITUTE, MENTAL HYGIENE, INFANTILE PARALYSIS

As in previous years, the Foundation made appropriations to the budget of the Rockefeller

Institute for Medical Research to cover a margin by which the income failed to meet all the current expenses. The erection of additions to buildings, war costs for supplies and scientific equipment, increases in wages and salaries, special compensations, etc., made it impossible to get through the year without supplementary appropriations which aggregated \$265,299. This amount is in addition to appropriations made to the Institute for special war-work in research, serum production, hospital care, and instruction of medical officers.

Additional appropriations have made possible studies in mental hygiene, the completion of the special after-care of infantile paralysis cases in New York City and State which the Foundation undertook in the summer of 1916, a study of dispensaries of New York City, and an expansion of the work of the National Organization for Public Health Nursing.

STUDIES IN INDUSTRIAL RELATIONS

Permission granted Mr. W. L. Mackenzie King, at a meeting of the Rockefeller Foundation, to publish as his own property the result of his inquiries into industrial relations, marked the conclusion of his official connection with the Foundation and brought to an

end that institution's work of investigation in this field.

When, in 1914, Mr. King, who had had wide experience in connection with labor conditions in their larger aspects and had served for some time as Minister of Labor in the Canadian Cabinet, was entrusted by the Rockefeller Foundation with a study of industrial relations, it was expected that he would visit the leading countries of the world, make first hand investigations, and, as a result of these inquiries, offer constructive suggestions concerning industrial and social policies.

The war not only prevented Mr. King from making these studies, but so completely changed the industrial situation in all countries that he was compelled to modify his plan. He decided, therefore, to prepare, on the basis of his own experience and the literature available, a statement of the underlying principles which are finding expression in the organization of industrial society. The resulting volume* has been published, not as an official report of the Foundation, but as a contribution by Mr. King personally to this important subject.

The war did more than change the present. It forced the consideration of the future on a

* *Industry and Humanity* by W. L. Mackenzie King: Houghton Mifflin Co., Boston and New York, 1918, pp. xii + 566.

scale never before attempted. England, France, and Germany are already formulating comprehensive programs of national reconstruction which include transportation, industry, housing, health, and education. In the United States many reconstruction proposals are being put forward by both governmental and private agencies. In these circumstances the Rockefeller Foundation deemed it fitting to discontinue studies of industrial relations, and to devote itself primarily to the program of medical education, public health demonstration, and war work co-operation to which it had become increasingly committed.

A RESUME OF WAR-WORK APPROPRIATIONS 1914-1919

The table on pages 54-55 gives a complete conspectus of all contributions made by the Rockefeller Foundation for war purposes from the beginning of hostilities in 1914 up to and including the appropriations voted in 1918 but payable in the year 1919. The total sum for the six years is approximately twenty-two and one-half millions. During the years 1914-1916 the Foundation maintained its own relief organization in Europe, but when the United States entered the war, this staff was withdrawn and

appropriations for allied countries were made directly to the American Red Cross. The policy of the Foundation has been to work so far as possible through a few co-ordinated agencies rather than to distribute relatively small sums to a large number of independent societies. Thus, in the field of Camp and Community Welfare, the recommendations of the government-appointed Commissions on Training Camp Activities were accepted as a guide. For example, the large gifts to the American Social Hygiene Association were toward budgets which were a part of the government's program for law enforcement and vice control in the areas tributary to army and navy camps.

In the field of medical research and relief, special appropriations were concentrated upon the Rockefeller Institute, which maintained a war hospital for 363 patients, prepared about 25,000 doses of serums, conducted special investigations, and gave instruction to 1,540 army and navy officers, nurses, and others; upon the National Research Council, a semi-governmental agency manned by the leading scientific men of the country; and upon the National Committee for Mental Hygiene, which rendered important aid in helping the army to recruit trained psychiatrists whose services proved so valuable in examining soldiers and sailors and in treating nervous

TABLE 1: War Work Expenditures 1914-1919—Payments to December 31, 1918, and Appropriations for 1919

	EXPENDITURES				APPROPRIATIONS 1919	TOTAL
	1914	1915	1916	1917	1918	
CAMP AND COMMUNITY WELFARE						
Y. M. C. A.			\$95,000	\$1,270,000	\$2,500,000	\$3,865,000
Y. W. C. A.				46,974	603,026	650,000
Knights of Columbus				100,000	200,000	200,000
Jewish Welfare Committee						100,000
War Camp Community Service				145,000		245,000
United War Work Fund					100,000	245,000
Commission on Training Camp Activities, Auxiliary Fund				25,000	2,514,700	5,014,700
American Social Hygiene Association					38,893	63,893
Committee of Fourteen, New York City				22,377	170,116	402,493
				5,000	210,000	5,000
MEDICAL RESEARCH AND RELIEF						
Medical Division, National Research Council					13,857	28,857
Rockefeller Institute: War Demonstration Hospital				200,000	175,000	430,000
War Research, Relief and Instruction (including work of Dr. Carrel)				1,836		182,537
Yale Mobile Hospital Unit	\$5,000	\$25,000		25,000	15,000	25,000
National Committee for Mental Hygiene				1,798	20,000	46,798
Demonstration in Teaching Hygiene					1,000	1,000

TABLE 1—CONTINUED: War Work Expenditures 1914-1919—Payments to December 31, 1918, and Appropriations for 1919

	EXPENDITURES				APPROPRIATIONS 1919	TOTAL
	1914	1915	1916	1917	1918	
HUMANITARIAN AID						
Armenia and Syria		70,000	490,000	50,000		610,000
Belgium	984,042	301,251	30,000	107,483	24,696	1,498,472
*France				10,611		10,611
Poland			25,531	61,250		86,781
Serbia		104,332	59,563			163,895
Turkey			25,000	30,504		55,504
Miscellaneous:						
American Red Cross	10,000			3,544,372	4,529,400	8,083,772
Prisoners of War Welfare		25,000	200,378	250,817	75,000	551,195
Contributions by War Relief Commission			6,377	3,204		9,581
War Relief Commission—Administration	5,571	31,757	34,819	43,742	1,395	117,284
Credit on % adjustment of exchange during previous years					(Credit) 2,558	(Credit) 2,558
Total	\$1,004,613	\$557,340	\$966,668	\$5,944,968	\$11,105,226	\$22,444,815

* The sum of \$10,611 represents the cost of a survey of the tuberculosis situation in France resulting from the war. A commission for the prevention of tuberculosis in France was later formed but as its activities are more in the nature of public health than of war work, its expenditures are not included in the above table.

disorders among the men. The work of the Tuberculosis Commission in France has been reported as a part of the public health program of the International Health Board.

It is to be noted that relief funds for Europe and Asia were entrusted, so far as the large items are concerned, to a few agencies which the Foundation believed were best able to use the money effectively. The American Red Cross, the Commission for Belgian Relief, the Committee for Armenian and Syrian Relief, and the International Y. M. C. A. Service for Prisoners of War, received the bulk of the appropriations. It is not to be inferred that the Foundation did not realize that a considerable number of other societies were doing excellent and needed work. It believed, however, that one of the duties of the American Red Cross was to unify or at least to correlate American efforts, and that it was not the function of the Rockefeller Foundation to set itself up as a censor or standardizer of relief agencies.

FINANCES FOR 1918

The table on page 57 presents a summary of receipts and expenditures for the fiscal year 1918.

The income from invested funds was approximately seven and a half millions. An additional

TABLE 2: *Receipts and Disbursements in 1918*

<i>Receipts</i>		<i>Disbursements*</i>	
<i>Extraordinary Funds Available</i>			
Income collected during year	\$7,610,827	War Work	\$11,105,226
Balance from 1917		Public Health	1,255,990
Held for payments on pledges		Medical Education and Research	2,419,866
for 1917 and prior years . . .	\$4,133,973	Miscellaneous Appropriations	128,312
Held for payments on pledges		Administration	140,808
for 1918	6,223,737		
Undesignated	1,271,338		
	11,629,048		\$15,050,202
Gift from Founder to make possible larger		Balance carried forward, all of which has	
gifts to Red Cross and United War Work		been pledged for expenditure in 1919 . . .	5,189,673
Fund	1,000,000		
TOTAL	\$20,239,875	TOTAL	\$20,239,875

* For detailed statement of disbursements, see pages 69 to 71.

gift of one million from the Founder was credited to current income and not to the principal fund. The balance of eleven and a half millions carried over from 1917 was largely mortgaged by pledges made in that year but not payable until 1918. This applies also to the balance of five millions carried forward into the budget of 1919. The estimated balance available for appropriation in 1920 falls below a half million. Only the spending of five millions of principal and the receipt of six and a half millions in gifts have made possible the extraordinary expenditures for war purposes during 1917 and 1918. With the return to a peace basis the regular expenses for public health and the heavy costs of building programs in China will for some time to come absorb a large part of the current income. The table on pages 69 to 71 gives a complete list of the expenditures made for all purposes during 1918, while the Treasurer's report (see pages 281 to 355) contains a full statement of all details as to the investments, other property, income, and expenditures of the Foundation.

THE WELFARE OF MANKIND THROUGHOUT THE WORLD

The many activities described in the foregoing pages are consistent parts of a unified

program which is dominated by a purpose to promote the general aim of the Foundation as expressed in its charter: the Welfare of Mankind throughout the World. With the coming of peace the nations are making an effort to come into closer relations of understanding and good will. Gradually, more normal conditions of intercourse will be re-established. Restrictions upon travel and commerce will be relaxed. There will be an exchange not only of commodities but of ideas. Each country will be urged to contribute its best achievements to a common fund upon which all lands may draw. In this commerce of culture, science, sympathy, and idealism, the Rockefeller Foundation desires to put its policies, personnel, and resources at the service of the world.

THE ROCKEFELLER FOUNDATION

Report of the Secretary

To the President of the Rockefeller Foundation:

Sir:—

I have the honor to submit herewith my report on the activities of the Rockefeller Foundation for the period January 1, 1918, to December 31, 1918.

Respectfully yours,

EDWIN R. EMBREE,

Secretary.

SECRETARY'S REPORT

The review by the President outlines the policies by which the Rockefeller Foundation is being guided in its work, sketches its present program, and describes the results aimed at and accomplished during the year 1918. The following report depicts the organization and the agencies through which these results were reached, and outlines the methods by which the programs of the several departments were carried out.

ORGANIZATION AND AGENCIES

The officers and members of the Rockefeller Foundation during 1918 were as follows:

John D. Rockefeller, Jr.	<i>Chairman of the Trustees</i>
George E. Vincent	<i>President</i>
Edwin R. Embree	<i>Secretary</i>
Louis G. Myers	<i>Treasurer</i>
Robert H. Kirk	<i>Comptroller</i>
Lefferts M. Dashiell	<i>Assistant Treasurer</i>
Edyth L. Miller	<i>Librarian</i>

MEMBERS

Wallace Buttrick	Starr J. Murphy
Simon Flexner	John D. Rockefeller
Harry E. Fosdick	John D. Rockefeller, Jr.
Frederick T. Gates	Wickliffe Rose
A. Barton Hepburn	Julius Rosenwald
Charles E. Hughes	Martin A. Ryerson
Harry Pratt Judson	Frederick Strauss
George E. Vincent	

EXECUTIVE COMMITTEE

George E. Vincent, *Chairman*
Wallace Buttrick Starr J. Murphy
Simon Flexner Wickliffe Rose
Edwin R. Embree, *Secretary*

Regular meetings of the Foundation were held in February, May, and December. Details of work, within general policies approved by the Foundation, were determined upon from time to time by the Executive Committee, which held eighteen meetings during the year.

METHODS OF CARRYING OUT WORK

The agencies through which the Foundation accomplishes its work are of two classes:

1. Those agencies which it creates to carry out specific programs.
2. Other existing organizations, unaffiliated with the Foundation, to which it makes appropriations in order to enable them to carry out specific programs.

Agencies of the first class, that is, departmental organizations, have been maintained during the year, as follows:

1. International Health Board.
2. China Medical Board.

The following were the members and the principal officers of these departmental boards:

INTERNATIONAL HEALTH BOARD

George E. Vincent, *Chairman*

Hermann M. Biggs	Starr J. Murphy
Wallace Buttrick	Walter H. Page
Simon Flexner	John D. Rockefeller, Jr.
Frederick T. Gates	Wickliffe Rose
William C. Gorgas	William H. Welch

Edwin R. Embree, *Secretary*

Wickliffe Rose,	<i>General Director</i>
John A. Ferrell, M.D.,	<i>Director for the United States</i>
Victor G. Heiser, M.D.,	<i>Director for the East</i>
H. H. Howard, M.D.,	<i>Director for the West Indies</i>
W. Perrin Norris,	<i>Associate Director for the East</i>
L. W. Hackett,	<i>Associate Regional Director (for Brazil)</i>
Ernst C. Meyer,	<i>Director of Surveys and Exhibits</i>

CHINA MEDICAL BOARD

George E. Vincent, *Chairman*

Wallace Buttrick	John R. Mott
Simon Flexner	Starr J. Murphy
Frederick L. Gates	Francis W. Peabody
Frank J. Goodnow	John D. Rockefeller, Jr.
Roger S. Greene	Wickliffe Rose
Harry Pratt Judson	William H. Welch

Edwin R. Embree, *Secretary*

Wallace Buttrick,	<i>General Director</i>
Roger S. Greene,	<i>Resident Director in China</i>

These Boards have carried out their programs with funds appropriated by the Rockefeller Foundation.

ASSISTANCE TO OTHER AGENCIES

In addition to the work carried out through the departmental organizations described above, the Rockefeller Foundation has contributed during the year to the accomplishment of work undertaken by other and unaffiliated organizations.

The work of the year, whether through its own agencies or by assistance to unaffiliated organizations, has been chiefly within the three fields of war work, public health, and medical education.

On pages 69 to 71 will be found a summary of payments made by the Rockefeller Foundation for all purposes during the year 1918. This tabular summary outlines, in terms of expenditures, the work described in terms of aims and results in the President's review. In many instances these payments involve sums expended on account of appropriations made in former years. On the other hand, they represent but partial payments on many of the appropriations made during 1918, which will provide for continuing work during succeeding years. For a full statement of the finances of the Foundation, see the Report of the Treasurer, pages 281 to 355.

TABLE 3: *Expenditures of the Rockefeller Foundation
for the Year 1918*

I. WAR WORK

Camp and Community Welfare

United War Work Fund	\$2,514,700
Y. M. C. A.	2,500,000
Y. W. C. A.	603,026
Knights of Columbus	200,000
War Camp Community Service (Playground and Recreation Association of America)	100,000
Commissions on Training Camp Activities, Auxiliary Fund	38,893
American Social Hygiene Association and New York Committee of Fourteen for work under direction of Commissions	170,116
	<hr/>
	\$6,126,735

Medical Research and Relief

Rockefeller Institute—War Demonstration Hos- pital and Medical Research	\$310,701
National Research Council (Medical Division)	13,857
National Committee for Mental Hygiene	25,000
Demonstrations in Teaching Hygiene to Troops at Camp Meade	1,000
	<hr/>
	\$350,558

Humanitarian Aid

American Red Cross	\$4,529,400
Belgian Professors and Belgian Children	24,696
Prisoners of War Welfare	75,000
Other Expenditures in Various European Countries	1,395
Credit on Account Adjustment of Exchange during Previous Years	(Credit 2,553)
	<hr/>
	\$4,627,933

Total War Work	<hr/>	\$11,105,226
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II. PUBLIC HEALTH

International Health Board

Hookworm, Malaria, and Yellow Fever Work Throughout the World.....	\$514,504
Tuberculosis in France.....	447,574
Public Health Education in Brazil.....	18,881
Miscellaneous.....	108,335
After-Care of Infantile Paralysis Cases in New York City and State.....	38,957
Studies and Demonstrations in Mental Hygiene ...	17,050
School of Hygiene and Public Health of Johns Hop- kins University.....	91,960
Study of Dispensaries.....	3,729
National Organization for Public Health Nursing ..	15,000
	<hr/>
	\$1,255,990

III. MEDICAL EDUCATION AND RESEARCH

China Medical Board

Development of Medical Schools in Peking and Shanghai.....	\$1,850,344
Assistance to Unaffiliated Medical Schools	57,549
Assistance to Hospitals.....	123,686
Fellowships and Scholarships.....	51,575
Administration.....	45,677
Miscellaneous.....	2,757
Rockefeller Institute—Current Expenses.....	265,299
University of Chicago—Medical School.....	22,979
	<hr/>
	\$2,419,866

IV. MISCELLANEOUS

(Chiefly payments on continuing pledges of earlier years.)

American Academy in Rome.....	\$10,000
(Payment on ten-year pledge made in 1914)	
Bureau of Municipal Research.....	25,000
(Payment on five-year pledge made in 1915 for current expenses)	
Committee on Scientific Research in Govern- mental Problems.....	8,000
(Final payment on appropriations and pledges made in 1916)	

SECRETARY'S REPORT

71

Committee on Reference and Counsel of Annual Foreign Missions Conference of North America (Payment on ten-year pledge made in 1914 for correlating educational work in foreign fields)	\$50,000
National Committee for Prevention of Blindness..... (Final payment on five-year pledge made in 1914)	5,000
Study of Industrial Conditions..... (Completion of study begun in 1914)	2,440
New York Association for Improving Condition of the Poor..... (Payment on ten-year pledge made in 1914 for demonstration of social relief measures)	20,000
Grand Chenier Bird Refuge—Taxes and Expenses.....	7,872
	<hr/>
	\$128,312
	<hr/>

V. ADMINISTRATION

Maintenance of Executive Officers and Treasurer's Office.....	\$137,713
Purchase of Books and Furniture.....	3,095
	<hr/>
	\$140,808
	<hr/>
Grand Total.....	\$15,050,202
	<hr/>
	<hr/>

INTERNATIONAL HEALTH BOARD

Report of the General Director

To the President of the Rockefeller Foundation:
Sir:—

I have the honor to submit herewith my report as General Director of the International Health Board for the period January 1, 1918, to December 31, 1918.

Respectfully yours,

WICKLIFFE ROSE,
General Director.

INTERNATIONAL HEALTH BOARD

OFFICERS AND MEMBERS

GEORGE E. VINCENT, *Chairman*
WICKLIFFE ROSE, *General Director*
HERMANN M. BIGGS
WALLACE BUTTRICK
SIMON FLEXNER
FREDERICK T. GATES
WILLIAM C. GORGAS
STARR J. MURPHY
WALTER H. PAGE
JOHN D. ROCKEFELLER, JR.
WILLIAM H. WELCH

EDWIN R. EMBREE, *Secretary*

PERSONNEL OF STAFFS DURING 1918

ADMINISTRATIVE STAFF

WICKLIFFE ROSE, *General Director*

JOHN A. FERRELL, M.D., *Director for the United States*

VICTOR G. HEISER, M.D., *Director for the East*

HECTOR H. HOWARD, M.D., *Director for the West Indies*

W. PERRIN NORRIS, *Associate Director for the East*

L. W. HACKETT, *Associate Regional Director (for Brazil)*

ERNST C. MEYER, *Director of Surveys and Exhibits*

FIELD STAFF

HOOKWORM WORK

Australia:	J. H. Waite, <i>State Director</i>
	S. M. Lambert, <i>Special Member of Staff</i>
Brazil:	L. W. Hackett, <i>Associate Regional Director</i>
	J. L. Hydrick, <i>State Director</i>
	Paes de Azevedo, <i>Associate State Director</i>
British Guiana:	F. W. Dersheimer, <i>State Director</i>
Ceylon:	W. Perrin Norris, <i>Associate Regional Director</i>
	W. P. Jacocks, <i>Senior State Director*</i>
	J. E. Snodgrass, <i>State Director**</i>
China:	S. A. Winsor, <i>Senior Field Director</i>
	F. C. Yen, <i>Associate State Director</i>
	J. B. Grant, <i>Associate State Director</i>
Costa Rica:	L. Schapiro, <i>Senior State Director</i>
Dutch Guiana:	W. H. Kibler, <i>State Director**</i>

* In Military Service.

** Resigned.

Guatemala:	A. M. Struse, <i>State Director</i> ***
	J. L. Rice, <i>Associate State Director</i> **
Fiji:	G. P. Paul, <i>State Director</i> *
Maryland:	F. A. Miller, <i>Senior Field Director</i> *
Mississippi:	C. Cross, <i>Associate State Director</i>
Nicaragua:	D. M. Molloy, <i>Senior State Director</i>
North Carolina:	B. E. Washburn, <i>Senior State Director</i>
Panama:	W. T. Burres, <i>State Director</i>
St. Vincent:	P. B. Gardner, <i>State Director</i>
Salvador:	C. A. Bailey, <i>State Director</i>
Seychelles:	J. F. Kendrick, <i>State Director</i>
Siam:	M. E. Barnes, <i>State Director</i>
Texas:	P. W. Covington, <i>Senior State Director</i>
Trinidad:	G. C. Payne, <i>State Director</i>

MALARIA WORK

Arkansas:	H. A. Taylor, <i>State Director</i>
Mississippi:	C. C. Bass, <i>Scientific Director</i>
	H. H. Howard, <i>Regional Director, in charge of control measures in Hinds county</i>

YELLOW FEVER WORK

Commission to Ecuador

A. L. Kendall, *Chairman*
 Hideyo Noguchi
 C. A. Elliott
 Mario G. Lebrede
 H. E. Redenbaugh

* In Military Service.

** Resigned.

*** Deceased.

Commission to Central America

William C. Gorgas

C. L. Furbush

Victor G. Heiser

Guatemala: J. H. White**Ecuador:** M. E. Connor, *State Director***SPECIAL WORK****Tuberculosis Work in France**Livingston Farrand, *Director*James Alexander Miller, *Associate Director*Selskar M. Gunn, *Associate Director*B. L. Wyatt, *Associate Director*

Homer Folks (Representing the American Red Cross)

Hospital Ship for the Philippine IslandsA. F. Coutant, *Physician in Charge*Teresa McKimmey, *Nurse*Mrs. A. F. Coutant, *Bacteriologist***Brazilian Advisory Committee**Carlos Chagas, *Chairman*

Alexander Pedroso

Vital Brazil

School of Hygiene and Public Health, Sao PauloS. T. Darling, *Professor of Hygiene and Public Health*W. G. Smillie, *Associate Professor of Hygiene and Public Health***Adviser in Medical Education**

R. M. Pearce

INTERNATIONAL HEALTH BOARD

The resolutions creating the International Health Board dedicated it to the field of preventive medicine. Its immediate object was to extend measures for the relief and control of hookworm disease to countries throughout the world, and to follow up these measures with efforts to assist in the establishment of permanent agencies for promoting public sanitation and spreading the knowledge of scientific medicine. It was contemplated that the treatment and cure of hookworm disease would make a strong appeal, and serve as an excellent starting-point from which the various states and nations might develop and put into execution well-rounded, comprehensive programs for advancing the public health.

THE POLICY JUSTIFYING ITSELF

It is therefore especially gratifying that in submitting this, the Fifth Annual Report, it is possible to present much additional information showing that hookworm disease is a serious menace to many millions of people. As further experience is gained with measures for its control, the evidence becomes more and more convincing that these measures afford one of the best single means of creating a widely understood concept

of what modern health measures may accomplish. Hookworm control demonstrations almost everywhere are being followed by a desire on the part of the people for better public health administration.

INCREASED APPROPRIATIONS BY HEALTH DEPARTMENTS

One of the most significant developments of the year's work was the increased financial participation of official health agencies in demonstrations for the control of hookworm disease. Incidentally, these demonstrations resulted in the organization and development of permanent agencies for the improvement of general health conditions. In Brazil, in Australia, in Ceylon, and in the Southern United States, local agencies enlarged their hookworm programs and provided additional funds. The method of manifesting interest through an increase in local appropriations found expression, however, in a number of other countries as well. In fact, peoples and governments everywhere seemed actuated by the desire to increase their health activities. The people at large are realizing more and more that the health of their communities is their responsibility, and that all work for bettering health conditions is their task,—theirs to support, theirs to administer, and theirs to profit by.

CONTROL OF YELLOW FEVER

In 1916 a Commission was organized to locate the endemic foci of yellow fever and to ascertain the practicability of eradicating the infection from these centers. The Commission visited all regions in South America in which yellow fever had been reported or suspected in recent years, and reported its findings. War conditions made it necessary to suspend the operations which, following the Commission's recommendations, had been authorized for 1917, but work under the direction of Major General W. C. Gorgas was again begun in 1918.

INVESTIGATION OF YELLOW FEVER AND RELATED INFECTIONS AT GUAYAQUIL

Arrangements were completed in June, 1918, to undertake at Guayaquil, Ecuador, a study of yellow fever infection and related infections which are frequently confused with yellow fever. The diagnosis of this fever has been extremely difficult. There have been no definite symptoms nor group of symptoms nor laboratory tests that could be accepted as conclusive. Even the findings of competent commissions have not in all cases sufficed to dispel the last honest doubt. It seemed advisable, therefore, before undertaking control measures on a large scale, to subject

these baffling infections to careful laboratory study with a view to contributing, if possible, to the true etiology of yellow fever. Guayaquil seemed to offer the material and the Government of Ecuador welcomed the proposal.

Personnel of Commission to Guayaquil and Subjects Studied

The investigation was entrusted to a Commission composed of Dr. Arthur I. Kendall, Dean of the Northwestern University Medical School, Chairman, Dr. Hideyo Noguchi, of the Rockefeller Institute for Medical Research; Dr. Mario G. Lebreto, of Cuba, Dr. Charles A. Elliott, and Mr. Herman E. Redenbaugh. The Commission, provided with laboratory equipment, arrived in Guayaquil on August 2. It was extended the courtesy of an official reception and was given every facility for the conduct of its investigations. The results of its activities have been reported in the form of four separate studies, as follows:

1. A Sanitary Survey of the Republic of Ecuador, by Drs. Kendall and Lebreto;
2. A Bacteriological Study of Yellow Fever, by Dr. Noguchi;
3. A Clinical Study of Yellow Fever, by Dr. Chas. A. Elliott, and Supplementary Report by Dr. Lebreto;
4. A Chemical Study of Yellow Fever, by Mr. Redenbaugh,

Isolation of Yellow Fever Organism

Dr. Noguchi succeeded in isolating an organism, to which he has given the name of *Leptospira icteroides*, which is the apparent cause of yellow fever. At the end of 1918 much work was still required to demonstrate that the true etiologic agent had been discovered, but the prospect for success is most encouraging. If the germ of yellow fever has been discovered it will still further simplify the problem of eradicating the seed-beds of yellow fever; and upon the successful completion of that task, the disease should disappear from the earth.

YELLOW FEVER EPIDEMIC IN GUATEMALA

An epidemic of yellow fever made its appearance in Guatemala in June, 1918. At that time there were large concentrations of American soldiers in the neighborhood of the southern ports of the United States. The Surgeons General of the United States Army and the United States Public Health Service therefore regarded the presence of an uncontrolled epidemic so near the border as a menace calling for energetic measures. After consultation with the Guatemalan Minister in Washington, the Board tendered its services to the President of the Republic of Guatemala, offering to send a competent medical officer to co-operate in bringing the epidemic under con-

trol. The offer was promptly accepted. On July 11, 1918, Senior Surgeon Joseph H. White, who had been released by the Army and granted leave by the Public Health Service for the detail, undertook this task.

Route Traversed by Infection in Guatemala

On arriving in Guatemala and making an inspection of the infected region, it was ascertained that the disease had spread to seventeen communities on or near the west coast. The infection seems to have been introduced into Guatemala from southwestern Mexico. Entering Guatemala apparently from Tapachula and appearing first in that country in the town of Ayutla, it spread from that point along the International Railway, eventually reaching Retalhuleu and Escuintla, and extending as far south as San Jose. In the seventeen communities into which the infection was introduced, 550 cases of yellow fever and 200 deaths were reported.

Control Measures Pursued in Guatemala

The President of Guatemala gave Dr. White full authority and directed the Governors of Guatemalan states to give all necessary aid. Quarantine was established and maintained, physicians were drafted into service, a system of

daily house-to-house inspection was established in each infected community, suspected cases were promptly isolated, the houses from which they were removed were fumigated, and measures were inaugurated and systematically carried out for the destruction or control of the breeding places of the *stegomyia* mosquito. Special quarantine measures were employed to prevent the spread of the disease to the Atlantic coast. As the only route by which yellow fever was likely to spread to the Atlantic Coast was by the railroad which passed over the dividing mountain at an elevation of 5,000 feet, this was comparatively simple.

By September 19 the disease was under complete control, and after December 2 no further cases occurred. Vigilance was continued, however, up to the end of the year. The outcome was especially gratifying and encouraging in that it demonstrated that yellow fever could be controlled with the personnel and facilities available in Central American countries, and at a cost well within their financial ability.

EFFORTS TO EXTERMINATE YELLOW FEVER AT GUAYAQUIL

An arrangement has been entered into with the Government of Ecuador by which an effort is to be made to free that country and the west

coast of South America of yellow fever infection. Operations to this end are now under way. Following the departure of the Yellow Fever Commission, Dr. M. E. Connor, a member of the Board's field staff, was detailed to inaugurate measures for the extermination of this disease at Guayaquil. He arrived in Ecuador on November 12 and was most courteously received. Plans were agreed upon, Dr. Connor was made a director of the work under the department of health, and on November 27 active operations began. By the end of December, 125 men had been engaged and twenty-five mosquito squads under competent direction were at work. The Government, the people, and the press are giving energetic co-operation. Yellow fever is reported as having been unusually prevalent this season. The work now in progress, however, is expected to result in the near future in a definite reduction in the number of cases, and ultimately in the extermination of the disease.

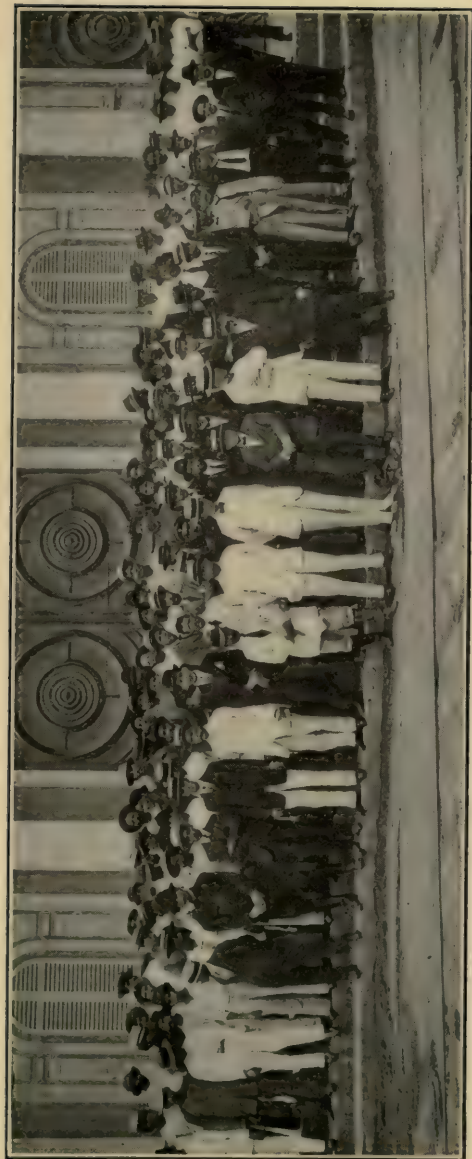


Fig. 2.—Yellow fever commission and staff in Guayaquil, Ecuador

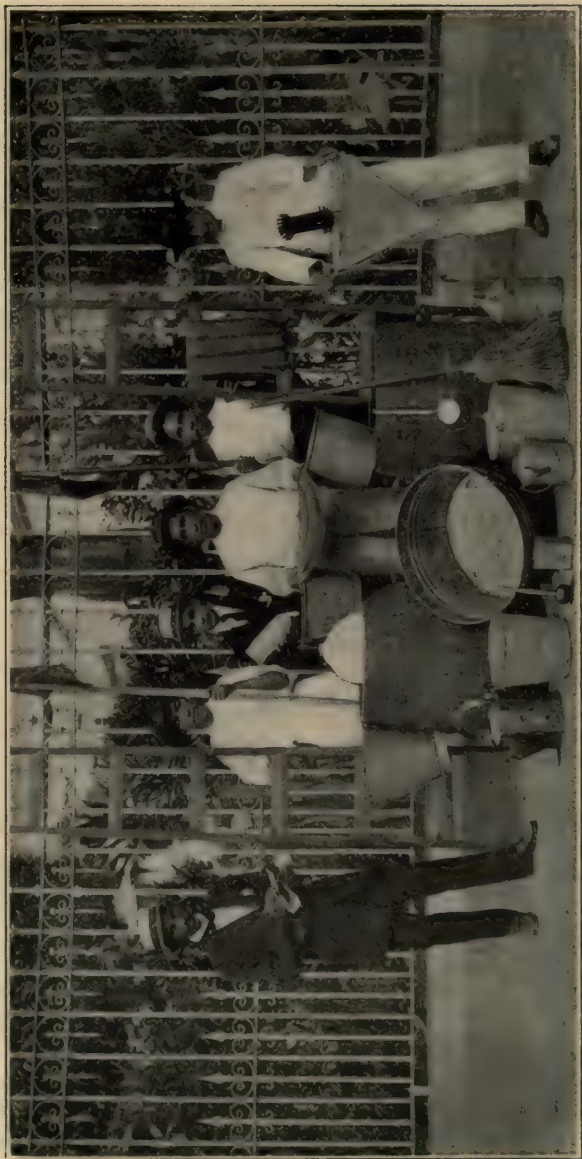


Fig. 3.—Anti-mosquito squad and implements. Yellow fever campaign. Guayaquil, Ecuador

SIGNIFICANT DEVELOPMENTS AND RESULTS IN HOOKWORM CONTROL

During the year, work for the relief and control of hookworm disease was conducted in co-operation with the following states and countries:

Southern

United States:

Alabama
Arkansas
Georgia
Kentucky
Louisiana
Maryland
Mississippi
North Carolina
South Carolina
Tennessee
Texas
Virginia

West Indies:

British Guiana
St. Lucia
St. Vincent
Trinidad

Central America:

Costa Rica
Guatemala
Nicaragua
Panama
Salvador

The East:

Ceylon
China
Fiji
Seychelles
Siam
Queensland (Australia)

Brazil:

Federal District
Rio de Janeiro
Sao Paulo

In addition, hookworm infection surveys were completed in Jamaica, Guam, and the State of Sao Paulo, and another was begun, but not completed by the end of the year, in the State of Minas Geraes, Brazil.

Agencies Undertaking Control Measures Independently

The Republic of Paraguay, the State of Pernambuco (Brazil), and Bengal and United

Provinces in India, inaugurated work for the control of hookworm disease entirely under Government auspices. The city of Rio de Janeiro, Brazil, with a population of 1,130,000 and a school population estimated at 275,000, arranged to examine and treat its school children, and the Government of Java began the treatment of all infected soldiers in its army.

Invitations to Participate in Control Measures

Notwithstanding the unsettled conditions produced by the war, requests for participation in measures for the control of hookworm disease continued to arrive from various countries. During the year, invitations of this kind were received from Colombia in South America, from Barbados, Curacao, and Santo Domingo in the West Indies, from the Madras Presidency in India, from Kelantan in the Federated Malay States, and from Mauritius.

Findings of Infection Surveys

The three infection surveys completed during the year indicated that in Jamaica approximately 60 per cent of the inhabitants have hookworm disease; in Sao Paulo, approximately 60 per cent; and in Guam approximately 70 per cent. The surveys of Jamaica and Sao Paulo are to be followed by comprehensive co-operative

attacks on the disease, and it is likely that the medical service of Guam will undertake similar measures entirely under its own auspices.

Mental Retardation from Hookworm Disease

The examinations for hookworm disease made among United States soldiers confirmed in a striking way the Board's experience of the past few years, and demonstrated that even light hookworm infections are of great importance. Judged by the Binet-Simon and other tests, many full-grown soldiers who harbored comparatively few hookworms had the mentality of persons only twelve years of age. The mentality of 10,000 white men at Camp Travis who harbored the disease was about 33 per cent below normal. Negroes were infected quite as frequently as whites, but they appeared to be relatively immune to the serious effects of the disease and did not show the same predisposition to other diseases or the same reduction in mentality.

Mental tests of a similar nature among 340 school children in Queensland, Australia, showed that there was an average retardation of approximately two years among heavily infected children. The longer the infection persisted, the greater was the retardation. The average retardation of lightly-infected cases was nine months.

Physical Improvement Following Treatment

In Siam, the weights of ninety-nine lightly infected soldiers were taken upon their entrance to the army, and again at the expiration of a year. Meanwhile, sixty-nine of these soldiers were treated for hookworm disease, and the other thirty remained without treatment. Those who were treated gained an average of 10.6 pounds in a period of one year; those who were not, an average of only 1.1 pounds. In Ceylon—where the infection rate among estate laborers averages 98 per cent and many severe infections are found—there had been 3,694 admissions to hospital in one district the year before treatment for hookworm disease was carried out. The following year, with an increased population, the number dropped to 2,604,—a reduction in the morbidity rate of at least 27 per cent. Again, in the same colony, among a laboring population of 17,838 on a certain group of estates, the death rate from influenza was twice as high among those who had not been treated for hookworm disease as among those who had received treatment.

Increased Wages and Greater Earning Capacity

In Costa Rica, sixty-six laborers before being treated for hookworm disease normally cultivated 563 acres of coffee monthly. After

being treated for hookworm disease they cultivated 750 acres, resulting in a net monthly increase in wages of 27 per cent after allowing for a 15 per cent reduction in unit pay. Moreover, in India, Clayton Lane reports that the amount of work increased 20 per cent on one estate and 50 per cent on another, and on both was of better quality than before the laborers were treated; while reports from British Guiana indicate that the efficiency of the laborers employed by one company increased from 25 to 50 per cent after hookworm measures were put into operation.

Importance of Mild Infections

It will be apparent from the preceding paragraphs that mild infections require treatment. One mildly infected person in a short space of time may transmit the disease to an unlimited number of other persons. The fact that in any locality the disease is found in only a moderate or mild form should not encourage that locality to neglect measures for its control. Not only may the disease be readily stamped out when the infection is light, but unless active control measures are undertaken it is almost certain to spread and to increase in intensity, and to develop into a problem of serious import to the community.

Soil Sanitation as a Means of Control

The crux of the hookworm problem is to prevent the infected soil from coming into contact with the hands, feet, or other bare portions of human beings. The most important undertaking in all efforts to stamp out the disease is therefore to prevent the deposit of ova-impregnated feces upon the surface of the ground. This may be accomplished by providing for the construction and use of properly built and adequate latrines to serve as receptacles for the contaminated human discharges. To assure the installation, maintenance, and use of sufficient and satisfactory latrines is, however, a formidable undertaking, and involves the task of inducing hundreds of millions of people in infected regions to abandon habits ingrained by centuries of custom. During recent years much of the Board's attention has been directed to aiding health departments to bring about the safe disposal of human excrement. Many of the details in relation to this work are of extreme interest and will be found on pages 166 to 185 of the appendix.

Latrine Construction Prerequisite to Hookworm Treatment

It is now fairly well recognized, and is becoming more so with increasing experience, that in order to make hookworm control measures

effective, thorough provision must be made in advance for the proper disposal of human discharges. Thus, in Nicaragua, Seychelles, Ceylon, Jamaica, Barbados, and other countries, communities desiring the Board's participation in efforts to control hookworm were advised that assistance could not be rendered unless latrines or other proper methods for disposing of human excrement were installed and in use in advance of treatment being undertaken. There is every reason to believe that in this way the number of re-infections can be greatly reduced.

Growth of Interest in Public Health throughout Brazil

Increased interest and support for rural health work have followed the hookworm demonstrations which have been conducted in Brazil



Fig. 4.—Brazilian states appropriating for hookworm work. Solid star denotes co-operative effort; open star, work conducted wholly by state

during the past few years. The Federal Government has appropriated \$250,000 with which to co-operate with the states in a program of rural sanitation in which the control of hookworm disease through soil sanitation, and the control of malaria, are

to be given foremost consideration. The several states of Brazil are meeting the Federal proposal with liberal appropriations. Up to the end of the year approximately \$750,000 had been made available for the purpose.

County Health Service in Southern United States

Directly as a result of the interest in disease control created by the hookworm demonstrations in the Southern States, county health departments with full-time health officers are gradually being organized. North Carolina was the first state in the South to meet its rural health problems by effective organization on a county basis. Other states are rapidly introducing similar programs. In order to stimulate rural sanitation, the Board assumes part of the expense involved. Its contribution, in the case of North Carolina, is on a decreasing scale for a three-year period. At the expiration of this time, the State and the counties jointly will bear the entire expense.

Health Developments in Australia

On invitation by the Commonwealth Government of Australia, a hookworm infection survey was conducted in Papua in 1917. The survey revealed that the concentration of laborers on plantations and the periodical return of the laborers to their villages intensified the hookworm infection and assisted in spreading the disease among

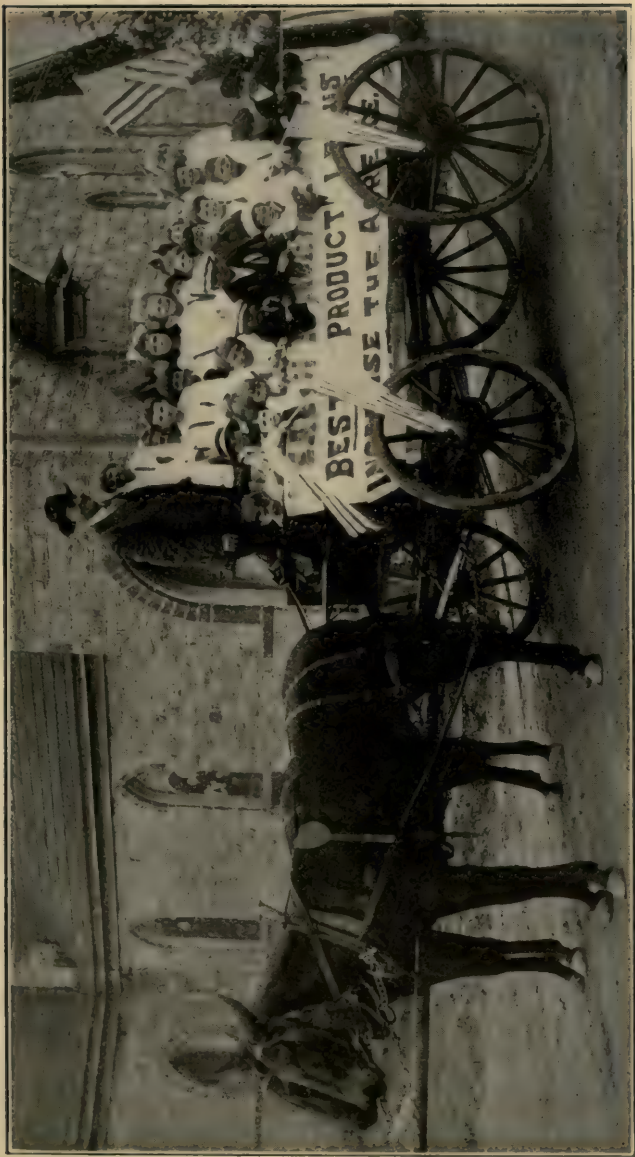


Fig. 5.—County health rally in North Carolina

the native population. Following the survey, the Australian Government approved a proposal for the organization of a health service for the colony and the inauguration of active measures for the



Fig. 6. — Australia and New Guinea. State of Queensland indicated by hatching. Area of intensive work against hookworm disease (1918) in solid black

control of hookworm disease, and made a preliminary appropriation of \$5,000 for carrying out the plan. If the proposals of the Peace Conference are carried into effect, Australia will be charged with the responsibility of administering the former German possessions in New Guinea, and, as a result, it

seems likely that the health program proposed for Papua may be extended to include the whole island of New Guinea.

The survey of Papua was followed by a demonstration in hookworm control in Queensland. This demonstration was carried out in co-operation with the health department of that State. The Commonwealth Government has now proposed a five-year period of co-operation in carrying out in Queensland and in the other states of Australia, a program for rural sanitation in

which hookworm control is to play a leading part. At the outset the Board will make a substantial contribution toward the maintenance of this project. This contribution will decrease 20 per cent annually and at the end of five years the entire expense will be borne by Australia.

TUBERCULOSIS WORK IN FRANCE

During 1918 the work of the Commission for the Prevention of Tuberculosis in France was conducted in four departments or divisions: the educational division, the medical division, the department of nursing, and the department of extension. All the work was done in close co-operation with the governmental authorities, private agencies, and the American Red Cross. The work of the department of extension was carried on in common by the American Red Cross and the Commission in twenty-seven departments of France. Further details with regard to the work in France will be found in the appendix, pages 201 to 206.

MALARIA CONTROL

The field experiments which have been conducted during the past three years in conjunction with Federal and state health agencies, have proceeded sufficiently far to warrant the assump-

tion that malaria control in the average town in the Southern States may be accomplished at a cost well within the means of the average community. It is hoped that these demonstrations will stimulate health departments throughout the Southern States to test the malaria measures which have been employed, and to carry out state-wide campaigns for the control of this disease if they find these methods successful.

Malaria is recognized as one of the most serious of the disabling diseases of man. In India it is estimated that each year there are 1,130,000 deaths and more than 100,000,000 cases of illness. The economic loss in our Southern States is incalculable. The greatest incidence of the disease occurs during October, which is the period of the year when labor is most in demand to harvest the crops. Therefore, anything which will tend to reduce the incidence of this disease will prove of enormous value in reducing human ills and will save vast sums in treasure. More detailed information with regard to the experiences with malaria during the past few years will be found in the appendix, pages 186 to 200.

PUBLIC HEALTH TRAINING

In March, 1918, the Department of Hygiene which has been established in connection with the *Faculdade de Medicina e Cirurgia*, at Sao Paulo, Brazil, was formally opened. This school is to be maintained jointly by the Medical School and the Board for a period of five years. If at the expiration of this period, the Department shall have justified itself, Government will assume its entire support. The services of two American scientists—Drs. Samuel T. Darling and Wilson G. Smillie—have been lent to the school for the five-year period, and fellowships have been provided for training two Brazilian physicians at the Hopkins School of Hygiene and Public Health, with a view to their returning to Brazil for service in the Department.

The school was particularly fortunate in beginning its work at a time when a new interest in public health was being manifested throughout Brazil. The Federal and state Governments were making liberal appropriations for rural sanitation, popular articles on disease prevention were appearing in the leading dailies, and two Brazilian societies of large influence were undertaking campaigns for acquainting their members and the public generally with the teachings of hygiene. As one result of this awakened interest,



Fig. 7.—Model to demonstrate malaria control operations. Department of Hygiene,
University of Sao Paulo

the Medical Faculty of the University of Rio de Janeiro decided to establish, in connection with that institution, a two-years' course in hygiene.

PUBLICATIONS

The following reports and publications were issued during the year:

PRINTED REPORTS (*for general distribution*)

Annual Report for the Year 1917.

LITHOGRAPHED REPORTS (*for limited distribution*)

Annual Reports for 1917 on Work for the Relief and Control of Hookworm Disease in the following countries:

West Indies:

Antigua	Dr. D. M. Griswold
British Guiana	Dr. F. W. Dershimer
Dutch Guiana	Dr. W. H. Kibler
Grenada	Dr. H. S. Colwell
St. Lucia	Dr. Stanley Branch
St. Vincent	Dr. P. B. Gardner
Trinidad	Dr. G. C. Payne

Central America:

Costa Rica	Dr. Louis Schapiro
Guatemala	Dr. A. M. Struse
Nicaragua	Dr. D. M. Molloy
Panama	Dr. W. T. Burres
Salvador	Dr. C. A. Bailey

The East:

Ceylon	Dr. W. P. Norris and others
Fiji	Dr. G. P. Paul
Seychelles	Dr. J. F. Kendrick
Siam	Dr. M. E. Barnes

Reports on Hookworm Infection Surveys in the following countries:

State of Rio de Janeiro, Brazil	Dr. L. W. Hackett
Pinghsiang Colliery, China	Dr. F. C. Yen
Guam	Dr. J. B. Grant
Java	Dr. S. T. Darling

Report on Malaria Control Demonstration at Hamburg, Arkansas—Dr. H. A. Taylor.

Report for the Year 1917 on Work of the Commission for the Prevention of Tuberculosis in France—Dr. Livingston Farrand.

In addition, staff members of the Board contributed the following articles and reports to various publications:

- DR. A. F. COUTANT. An epidemic of influenza at Manila, P. I. *Journal of the American Medical Association*, Chicago, 1918, LXXI: 1566-1567.
- DR. P. W. COVINGTON. Activities of the Bureau of rural sanitation of Texas. *Texas State Journal of Medicine*, Fort Worth, 1918, XIV: 173-175.
- DR. S. T. DARLING, DR. M. A. BARBER, and DR. H. P. HACKER. *Treatment of hookworm infection. *Journal of the American Medical Association*, Chicago, 1918, LXX: 499-507. Same reprinted; also summarized in Spanish by Dr. Emilio Echeverria.
- DR. L. W. HACKETT. A Rockefeller Foundation e a sua accao mundial; campanha contra a uncinariose. *Parana Medicina*, Curitiba, 1918, III: 484-488.
- Conferencia sobre a prophylaxia da uncinaria. *Gazeta Clinica*, Sao Paulo, 1918. (Newspaper article)
- Escolha de um medicamento melhor e methodo de administracao na uncinariose. Rio de Janeiro, Bensuard, 1918.
- Hygiene internacional. *Saude*, Rio de Janeiro, 1918, I: 178-183.
- Resume of results of the year's work in Brazil. *Boletin de Academia Nacional de Medecina*, Rio de Janeiro, 1918, LXXXIX: 212-224.
- DR. V. G. HEISER. American sanitation in the Philippines and its influence on the Orient. *American Philosophical Society, Proceedings*, Philadelphia, 1918, LVII: 60-68.
- Barrack life and respiratory diseases: some epidemiological observations on the recent outbreak of influenza. *Journal of American Medical Association*, Chicago, 1918, LXXI: 1909-1911.
- Death from volvulus caused by round worms. *Medical Record*, New York, 1918, xciv: 65. Same reprinted.
- Some of the accomplishments of Italian medical men in the war. *Journal of the American Medical Association*, Chicago, 1918, LXX: 24-27. Same reprinted.
- Waste caused by preventable diseases of intestinal origin. *Annals of the American Academy of Political and Social Science*, Philadelphia, 1919, p. 48-50. Same reprinted.
- DR. A. I. KENDALL. Recent developments in intestinal bacteriology. *American Journal of Medical Sciences*, Philadelphia, 1918, cxli: 157. Same reprinted.
- DR. J. A. MILLER. How America is helping France with her tuberculosis problem. *American Review of Tuberculosis*, Baltimore, 1918, II: 409-434.
- Social conditions in France. *New York Conference on Social Service, Proceedings*, 1918, p. 58-80.

* Reprints available.

- DR. G. P. PAUL. Disposal of human bowel excreta in the tropics. *New Orleans Medical and Surgical Journal*, 1918, LXX: 707-712.
- DR. LOUIS SCHAPIRO. El serampion. San Jose, Govt. 1918.
- DR. J. H. WAITE. The Queensland hookworm campaign (first progress report, covering period April 17 to December 1, 1918). *Medical Journal of Australia*, Sydney, 1918, II: 505-510.
- DR. B. E. WASHBURN. The North Carolina plan of county health work (with discussion). *Southern Medical Journal*, Birmingham, 1918, XI: 425-430.
- DR. F. C. YEN. Hookworm infection survey at the Pinghsiang colliery, China. *National Medical Journal of China*, Shanghai, 1918, IV: 81-89, 140-145.
- Uncinariasis in Pinghsiang colliery. *National Medical Journal of China*, Shanghai, 1918, IV: 8.

ADDITIONAL INFORMATION IN THE APPENDIX

The previous annual reports of the Board have been confined mainly to a general discussion of outstanding results. Frequent inquiries have been received for more detailed information, particularly with regard to the problems to be met in the control of various diseases and to the working methods employed in meeting these problems. This has seemed to justify including in this report a considerable amount of such information. The material is submitted in the following pages in the form of an appendix. It discusses somewhat at length the Board's experience with measures for the prevention, cure, and control of hookworm disease, its field experiments in malaria control, and its activities against tuberculosis in France.

APPENDIX

I

EXTENT AND SEVERITY OF HOOKWORM DISEASE

Hookworm disease exists wherever the larvae of the hookworm find favorable conditions of shade, moisture, and temperature for their propagation and growth. These conditions are commonly found in tropical and sub-tropical countries in the zone which encircles the earth between parallels 36° north and 30° south. The most favorable temperature for the development of the larvae is from 25 to 35° centigrade. Below 22° centigrade few larvae develop. Rainfall is an important contributing factor in the spread of the disease. In six adjoining settlements of Queensland, Australia, in which work was conducted during 1918, the percentage of hookworm infection ran parallel with the amount of rainfall. Thus, in two districts having an annual rainfall of less than 90 inches, the percentage of infection was 13.8, while that in four districts having more than 90 inches of rainfall was 27.8.

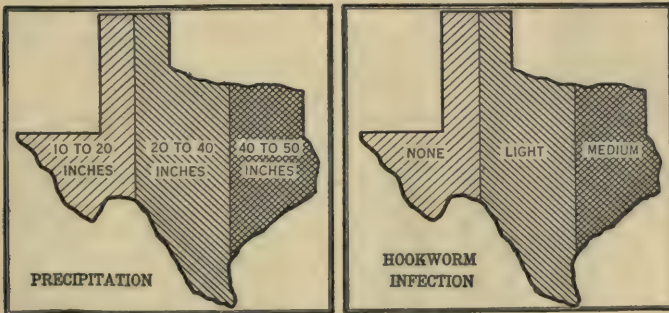


Fig. 8.—Correlation between rates of hookworm infection and amount of rainfall. Texas

Hookworm Primarily a Rural Disease. Persons who live in the country, away from sewerage, and who work in the soil, are much more frequently infected with the disease than city residents (see Fig. 9, page 112); while those who go barefoot, or in other ways allow the bare skin to come into contact with polluted soil, show correspondingly higher rates of infection than those who wear shoes. For example, the survey of the State of Sao Paulo, Brazil, concluded during 1918, showed 41.2 per cent infection among shoe-wearers, as

compared with a rate of 62.9 per cent among persons who went barefoot.

Wide-Spread Prevalence within Infected Region. An idea of the extensive prevalence of the disease within the infected zone may be gained from the following statements. In the sixteen foreign countries enumerated on page 91, measures for the relief and control of the disease were terminated during 1918 in 124 rural areas having an average population of 2,097. In three-fourths of these areas, more than sixty of every hundred persons examined were found to be infected. In eighteen of the areas the infection rate was between 90 and 100 per cent; in nineteen between 80 and 90 per cent; in twenty-four between 70 and 80 per cent; and in twenty-nine between 60 and 70 per cent. In only one area—the canton of San Domingo, in Costa Rica—was a rate lower than 20 per cent recorded. Here only 9.2 per cent of the inhabitants were found to be infected.¹

High Rate of Infection in India. Microscopic examination in Ceylon of more than 50,000 Tamil coolies from Southern India has shown more than 98 per cent of them to be infected. This confirms

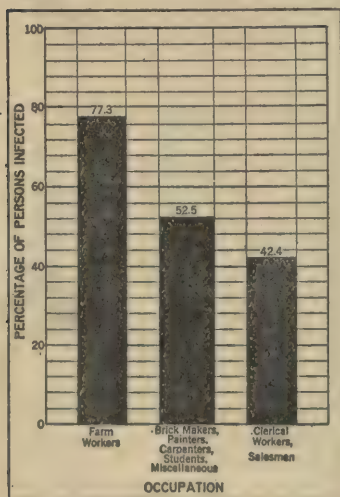


Fig. 9.—Rates of hookworm infection by occupation. Sao Paulo, Brazil

the investigations carried out by the Indian Medical Service at Negapatam—the great clearing port for labor leaving South India—which showed 99.8 per cent of the emigrant laborers to be infected. Much of India's population of 300,000,000 is under the burden of a heavy hookworm infection and is the source from which the disease is carried to many parts of the world. In some of the rural regions of this country, from 80 to 100 per cent of the population are infected.

The original investigation carried out by Lieut.-Colonel Clayton Lane under the auspices of the Indian Research Fund Association, in a group of tea gardens in Assam, showed 63 per cent of the 33,590 persons examined to be infected, and a second inquiry carried out by

the same investigator under the same auspices, in the jails of Bengal presidency, demonstrated the infection in 8,973, or 71.3 per cent of

¹ This low infection rate is ascribed by the director to the fact that all of the people are well-to-do and have for some time had adequate medical service at hand.

the 12,570 prisoners examined. In all, twenty-six jails were visited, and the rates of infection recorded ranged from 47.9 in the Presidency jail at Calcutta to as high as 86 per cent in the jail at Hooghly. The sanitary authorities believe that more than 30,000,000 of the 45,000,000 inhabitants of Bengal proper are infected, and are undertaking a systematic attack on the disease, beginning with a campaign in the schools.

Prevalence of the Disease in Brazil. The Director of Rural Sanitation estimates that more than 80 per cent of the adults and more than 90 per cent of the children living in rural portions of the Federal District of Brazil are infected with some form of intestinal parasite. The number infected with hookworm he puts at 100,000, or two-thirds of the district's rural population. Among the first 1,839 persons examined in Jacarepagua, a typical rural community of this District, the percentage found infected with hookworm was 75, and only six persons were found who were free of some form of intestinal parasite.

In the survey of the State of Sao Paulo, two of every three persons examined were found to be infected with hookworm disease, and four of every five with some type of parasite; while in two rural areas in the State of Rio de Janeiro, the percentages of hookworm infection recorded were 67.7 and 88.5. Among the first 450 persons examined in the State of Parana every one was found to be infected with hookworm, thus indicating that the littoral of this State, though well within the temperate zone, will show an incidence of infection among the highest in Brazil. In this country, as elsewhere, children and young adults are found to bear the brunt of the disease.

Infection Rates in Countries Newly Inaugurating Control Measures. An infection rate of 59 per cent among the first 3,354 persons examined in China is reported; of 76.7 among 31,298 residents of Siam; and of 22.5 per cent among 11,678 persons living in six small settlements of Queensland, Australia. These are countries in which co-operative control measures were first undertaken during 1918.

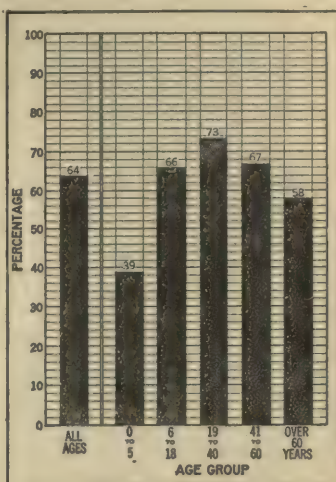


Fig. 10.—Rates of hookworm infection by age—all countries. Based on examinations from March 12, 1914, to December 31, 1918

Reports from Australia had indicated that there was little or no infection among the aborigines, but from 60 to 100 per cent of all those examined to date have been found infected. Arrangements for their treatment are now being made through the Chief Protector of Aborigines.

SEVERITY OF THE INFECTION

The severity of the disease is now believed by many authors to depend primarily upon the number of worms harbored by

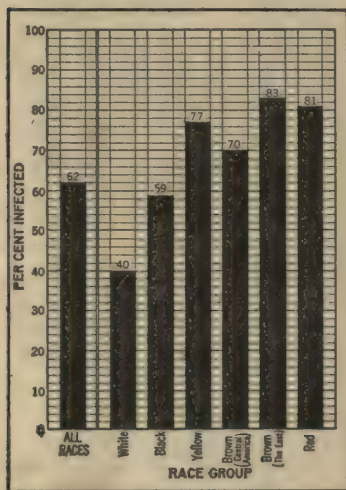


Fig. 11.—Rates of hookworm infection by race—all countries. Based on examinations from March 12, 1914, to December 31, 1918

infected individuals. Generally, the higher the percentage of persons infected in a given locality the larger is the average number of worms harbored by infected individuals, the more severe are the symptoms found, and the more difficult is the disease to bring under control. The difficulty of effecting cures in localities with high rates of infection is strikingly illustrated by figures compiled in Brazil and in Trinidad. In the former country, the percentage of persons cured by two treatments of the same drug, administered in the same manner and under practically the same conditions, was 38 in Rio Bonito, a municipality having an infection rate of 88.4 per cent, and 71 in Guarulhos, where the infection was 57 per cent.

The statistics for Trinidad (see Fig. 14, page 117) cover the examination of 42,284 residents of that colony during the period from May 15, 1915, to December 31, 1918. It will be noted that in districts with 25 to 29 per cent of their inhabitants infected, the percentage of infected persons cured by two treatments was as high as 75. As the rate of infection rose, the difficulty of curing increased, until in localities with extremely high rates of infection—representing between 95 and 99 per cent of their inhabitants—only 19 per cent of the infected persons could be cured by two treatments. The drugs used and the conditions of administration were practically the same in all districts.



Fig. 12.—One means of acquiring hookworm disease:
bare feet in contact with infected mud. Brazil



Fig. 13.—Method of night soil disposal in Federated Malay States. Permits dissemination of infected material

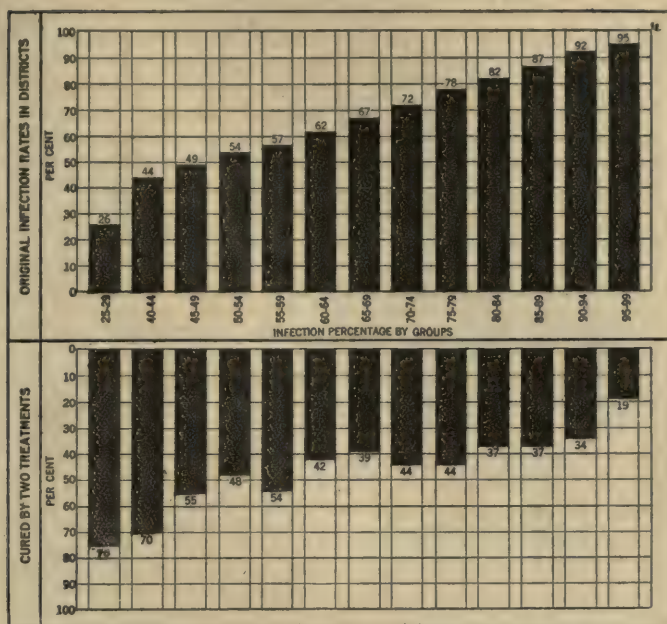


Fig. 14.—Difficulty of curing hookworm disease where infection rate is high. Relationship between rates of hookworm infection and cures by two treatments. One hundred fifty districts in Trinidad. Persons examined 42,284

Determining Severity by Counting the Worms. The number of worms harbored by a group of individuals may be ascertained quite accurately by giving them a vermifuge and counting the worms expelled after the drug has acted. It is usual to count the worms for a period of two or three days following each treatment. Worm-counts are of value not only because they reveal the average degree of infection in different communities, as well as the type of worm harbored, but also because they are of much assistance as a means of demonstrating the presence of the disease and of enlisting popular support in measures for its control. They were made a feature of the work during 1918 in Siam, Nicaragua, China, and Brazil.

Infection Index in Different Regions. In Siam the feces of fifty-nine persons were examined for seven hours after first treatment. The average number of worms expelled was forty-five. More than half (39) of the cases harbored less than twenty worms each. In Nicaragua, on the other hand, as many as 4,000 worms were recovered from a single patient, and in Brazil particularly high worm counts were obtained in the States of Sao Paulo and Rio de Janeiro. Here the incidence of the infection is reported to be high and the disease severe in form despite the fact that the

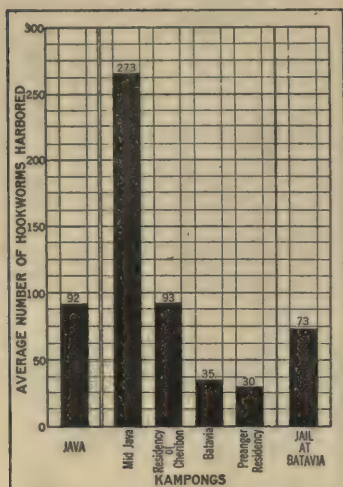


Fig. 15.—Hookworms harbored by three hundred seventy-eight infected persons in Java. Distribution by localities

worms as a result of the two treatments he was able to take. In a similar experiment among forty-five vagabond boys in the State of Sao Paulo, an average of 233 worms was obtained after treatment from nineteen boys who had always lived in the country, and an average of 59 from twenty-six boys who had always been city residents.

Degree of Infection Among Agricultural Workers in Brazil.

Townspeople are always more lightly infected than agriculturists. This is shown, for example, in Fig. 16, page 119, which compares the infection indices of town residents, mountaineers, and agricultural workers in Java. The urban dwellers treated in Brazil yielded, on the average, less than fifty worms, while groups of farm laborers expelled from 55 to 233. From three adult farm workers in Guarulhos, 1,390, 1,031, and 405 worms apiece, or 972 average, were obtained. The average number of worms harbored by all workers on coffee plantations in the States of Rio de Janeiro and Sao Paulo doubtless reaches 160 or more; children under fourteen years of age living on these farms have been found to harbor as many as 365 worms. Coffee growers and employers of agricultural labor in general realize what this means as a cause of debilitation and inefficiency, and are becoming interested in efforts to promote the health and work-

climate is cool the year round. The total of 29,029 hookworms recovered from 280 residents of these States, who were treated for determining the degree of infection, gave an infection index¹ of 104. This is twelve points higher than the index for Java, where the disease was thought to be more wide-spread in extent and more severe in form than in Brazil (see Fig. 15).

Worms Harbored by Brazilian Vagabond Boys. Nearly 11,000 worms were recovered from a group of eighty-one vagabond boys treated in the State of Rio de Janeiro. The counts ranged from 2 to 982; the average was 133. Another boy who was too weak to receive the three treatments which were administered to the first eighty-one, expelled 1,912

¹ Average number of worms per case.

ing capacity of their laborers through treatment for hookworm disease and the prevention of soil pollution.

Severity of Infection Among Southern Troops in U. S. Army. Knowlton, in his work at Camp Jackson, South Carolina, treated for hookworm disease a large number of infected soldiers from the Carolinas and Florida. Among sixty-nine white and eighteen colored cases, the average number of worms obtained from the whites was 155.3; from the colored, 38.3. In a considerable proportion of the soldiers the infection was mild in form, but all grades were encountered, and in a few cases the infection was severe; three white patients yielded 1,010, 1,263, and 1,704 worms, respectively.

Through the means of the laboratory car *Metchnikoff* there were unsurpassed facilities for observing the effects of hookworm disease upon troops of the Southern Department of the United States Army, embracing recruits from the States of Texas, Oklahoma, Arizona, and New Mexico. Marked clinical symptoms were absent in 90 per cent of the men who, upon microscopic examination, were found to be infected; on treatment the number of worms expelled the first day by 80 per cent of the infected soldiers ranged only from one to five. This is an unusually light infection. The men dealt with, however, were between twenty and thirty years of age, an age period in which individual infections are dying out, and only a small proportion came from regions of heavy infection.

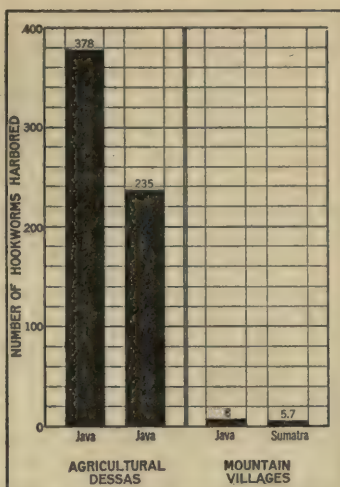


Fig. 16.—Comparison of number of worms harbored by agricultural workers and dwellers in mountain villages. Java and Sumatra

CORRELATION BETWEEN NUMBER OF WORMS AND PERCENTAGE OF HEMOGLOBIN

In general, there is definite relationship between the number of worms harbored and the amount of blood loss or anemia. This may perhaps be obscured by the resistance of the infected person, by abundant food, opportunities for rest, or by exceptionally active blood-forming processes, but the drain is none the less real and a

constant tax on the vital powers. Thus, in the State of Sao Paulo, Brazil, during 1918, the average hemoglobin of six boys above fourteen years of age who harbored more than four hundred worms each, was 63.7 per cent, as compared with an average of 72.7 per cent among forty-six boys of the same age who harbored less than seventy-five worms each. The normal hemoglobin of boys of this age is 84 per cent. Knowlton found, in his work among soldiers at Camp Jackson, South Carolina, that no severe reduction in hemoglobin was caused by less than five hundred worms. The hemoglobin of thirty-three of his patients each of whom had fewer than this number of worms, was between 80 and 89 per cent.

Importance of Other Factors Which Lower the Hemoglobin Index. All anemia encountered among the people in infected regions is not, of course, to be attributed to hookworm disease. Malaria and underfeeding, to say nothing of other devitalizing diseases and conditions, play important parts. The hemoglobin index of all 109 prisoners in the jail at Batavia, Java, for example, was 25.8 points below the normal 95 per cent. Experiments indicated that a loss of 6.8 points was due to hookworm disease, of 10.3 to malaria, and of 8.0 to hard labor. Again, in Fiji, where there is no malaria, underfeeding resulted in a group of East Indians having 9.5 per cent lower hemoglobin than another well-fed group of the same race. Both groups harbored the same number of hookworms.

Varying Effect of Equal Numbers of Worms Upon Men, Women, and Children. The Board's Uncinariasis Commission to the Orient, working with large numbers of persons from whom practically all hookworms had been expelled by vermifuge and counted, found that on the average, in the presence of the conditions that obtained in the areas dealt with, twelve hookworms caused a reduction of one per cent in hemoglobin. An equal number of worms produced more anemia among children than among women, and more among women than among men. Furthermore, when the types of infection resulting from equal numbers of *Ancylostome duodenale* and *Necator americanus* were compared, it was found that the former produced a more severe form of the disease than the latter.

II

EFFECTS OF HOOKWORM INFECTION

Hookworm infection works subtly through long periods of time. Its cumulative effects are handed down from generation to generation. The disease destroys economic efficiency and social development on the one hand, the while it undermines physical and mental health on the other. It is a menace and an obstacle to all that makes for civilization. As a handmaiden of poverty, a handicap of youth, an associate of crime and degeneracy, a destroyer of energy and vitality, it stands in the very forefront of diseases. Its effects express themselves in stunted physical and mental growth, blighted health and efficiency, retarded economic progress, and general degeneracy and decay. Labor is impaired, home standards are lowered, mental development is inhibited, and there is a tendency for the human machine to wear out before its time. Wherever treatment is systematically carried out and followed by rigorous control of further infection, marked improvement in health and general capacity results.

PHYSICAL RETARDATION

Hookworm disease saps the strength by such imperceptible stages that usually the patient himself does not sense any change in his physical condition from day to day, until his powers of resistance eventually become so lowered that the germs of tuberculosis, of pneumonia, of typhoid fever, or of some other acute infectious disease find favorable lodgment and all too frequently a fatal outcome results. Statistics show that the mortality rate of hookworm is greatly exceeded by the rates of the more spectacular diseases. But by its steady sapping of the strength of millions of people, continued without interruption over many generations, hookworm disease causes human misery and suffering of a much more severe character than its low death rate would lead one to expect.

Retardation as Measured by Hemoglobin Content. In Costa Rica, Nicaragua, Panama, and a number of other countries, blood examinations have been made with a view to determining approximately the degree of anemia which is associated with the infection. Among a total of 142,881 persons whose blood has been examined to date, three-fifths had a hemoglobin index below 70 per cent. By far the largest number of cases in any single group (69,718) fell between 50 and 69. Sixteen thousand, five hundred and forty-seven (16,547) cases were between 30 and 49, 2,493 between 10 and 29, and 201 below 10 (see Fig. 17). Of course not all this anemia is due to hookworm infection, as hard labor, underfeeding, malaria, and

a number of other devitalizing diseases and conditions play their parts in impoverishing the blood.

Increase in Hemoglobin

Following Treatment. From a number of countries, distinct gains in hemoglobin have been reported among groups of infected persons after treatment for hookworm disease. In Porto Rico, the average hemoglobin as estimated for the total population over a large area where the test was made, was raised from 43 in 1904 to 72 in 1914; in Dutch Guiana the average hemoglobin in a group of infected persons was 71 before treatment and 90 six months or more afterwards; in five towns of Nicaragua the hemoglobin index of infected persons rose from 61 to 74 as a result of treatment; in two areas of Panama from 59 to 68; and among a small group in Chieng-mai province, Siam, from 65.5 to 77.5.

During 1917 and 1918 the director of the work in Costa Rica had opportunity to test the blood of 40,402 infected persons before treatment for hookworm disease, and of 13,489 of the same persons (33 per cent) six months or more after they had been treated.¹ The examinations before treatment showed an average hemoglobin of 64.6 per cent; those after treatment, of 76.8 per cent. In different cantons of this country the gain ranged from as low as 3.0 per cent in San Marcos to as high as 25.0 in Alvarado.

That the hemoglobin index continues to rise for a considerable period following the close of regular campaign measures is suggested by observations made on the estate of Rodeo, in the canton of Mora, Costa Rica. On this estate the average hemoglobin index of persons just cured was 63.3. In a re-survey conducted two years later, it was 76.8 among the persons remaining uninfected.

Gain in Body Weight by Siamese Soldiers. It is customary for striking gains in body weight to follow treatment for hookworm disease. Such improvement in individuals has often been noted, and

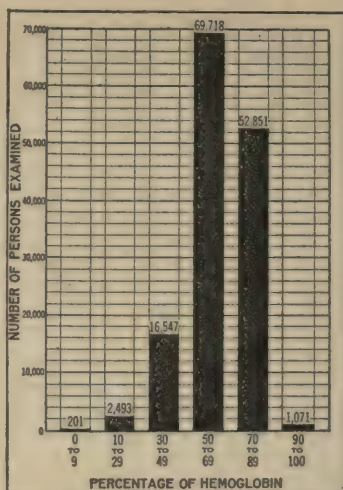


Fig. 17.—Reduction in hemoglobin associated with hookworm disease. Total of 142,881 persons examined to date

¹ It would, of course, be preferable to confine the comparison before and after treatment to the same number of persons. However, since the cases examined after treatment were taken at random and large numbers were involved, the figures are doubtless sufficiently accurate for practical purposes.

large numbers of separate instances could be cited of remarkable increases in weight within short periods of time. During 1918, Hluang Boriracksha, of the Siamese Army Medical Service, made observations on ninety-nine soldiers of the Siamese Army. All of these men had hookworm disease. Sixty-nine of them were treated once with fifty grains of thymol. The other thirty were given no treatment whatever. The treated men gained an average of 10.6 pounds in weight over a period of one year, while the untreated gained during the same period an average of only 1.1 pounds.

Hookworm as a Predisposing Factor to Other Diseases.

The 1918 influenza epidemic in Ceylon showed that on all the estates embraced within the Maskeliya area, with a total laboring population of 17,838, the death rate from influenza and its sequelae was twice as high among persons who had not been treated for hookworm disease as among those who had. The deaths numbered 111, or 7.5 per thousand, among 14,659 persons who had been treated for hookworm infection before being attacked by influenza, as compared with 43, or 13.8 per thousand, among 3,253 persons who had not been treated for hookworm. Similarly, Major Kofoed, of the United States Army Medical Service, reports that the hospital statistics and sickness records of 24,000 men at Camp Bowie during the period from October, 1917, to May, 1918, indicated that the resistance to disease was lowest and the mortality rates were highest among the organizations in which hookworm disease was most prevalent.

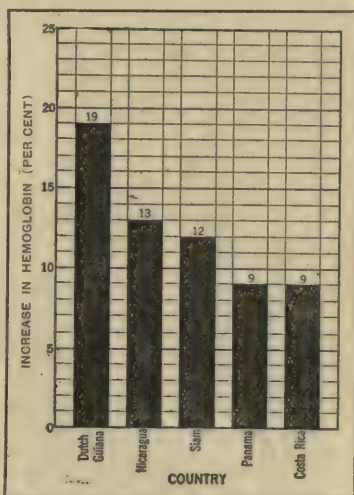


Fig. 18.—Increase in hemoglobin following treatment for hookworm disease.¹ All countries

Reduction of Morbidity Following Hookworm Campaigns.

That improved health follows treatment for hookworm disease is illustrated by the following instances:

a. *Decrease in admissions to estate and asylum hospitals in Trinidad.*

On one estate in Trinidad, as well as at the Orphanage and Industrial School located at Tunapuna in that colony, sanitary reform and the treatment of infected persons reduced by two-thirds the number of

¹ The figures indicate the difference between the hemoglobin index of infected persons before treatment and their index after treatment.

patients admitted to hospital. The work in the Orphanage was completed in April of 1916. During the last two months of the year, only three patients were admitted to the hospital, as compared with a monthly average of forty admissions for the previous four years. In another institution in the same colony, the Boys' Reformatory, the regular hookworm control measures were completed in March, 1918. Sixty or seventy ulcers had to be dressed daily before the boys were treated for hookworm disease, as compared with seventeen after they were treated. Of the latter number, only three were serious enough to require much attention.

b. Diminished sickness in areas of British Guiana. From the Peter's Hall and Belle Vue districts of British Guiana, where operations against hookworm disease were in progress during 1914 and 1915, the number of patients admitted to the public hospital at Georgetown during 1916 was 31.5 per cent lower than during 1914. In contrast with this, the reduction for rural districts in which measures against hookworm disease were not carried out, was only 6.5 per cent.

On one estate in this colony the amount of sickness had increased to such an extent that before the laborers were treated for hookworm disease an addition to the estate hospital was planned. As a result of the hookworm campaign which intervened between the planning of the addition and its erection, the addition was found unnecessary. So great was the reduction in the sickness after hookworm disease had been treated, that even the original quarters were seldom filled to capacity.

c. Lowered record of sickness calls on Ceylon estates. On seven estates of Ceylon there was a decrease of 1,132 sickness calls, or 44 per cent, for four months of 1917, following treatment of the laborers for hookworm disease, as compared with the same four months of 1916, before the laborers had been treated for the disease. The largest reduction occurred in the calls for second and third treatments, indicating that the improvement in health effected by treatment for hookworm disease resulted in the patients being more readily cured of all their maladies. The decrease in bowel complaints and in malarial fevers among the coolies on these estates was especially marked.

In another area the District Medical Officer reported that only 2,604 patients were admitted to hospital in 1918, after treatment for hookworm disease had been carried out in his locality, as compared with 3,694 in 1916, before systematic work against the disease had been begun. This represents a reduction of 27 per cent in the number of hospital admissions.

d. Lessening of sickness absenteeism on Indian tea estates. The investigation conducted by Lieut.-Col. Clayton Lane in the Darjeeling district in India showed that treatment resulted in noticeable improvement in the health and efficiency of labor. One manager wrote Dr. Lane that during the three months preceding the campaign against hookworm disease, at least forty-five men were continuously



Fig. 19.—Javanese severely infected with hookworm disease. Before treatment. Emaciated, weak. Unable to work for twelve years. Hemoglobin, 13 per cent



Fig. 20.—Same patient one year later, after treatment. Expelled 1,139 hookworms. Now employed in rice fields. Hemoglobin, 60 per cent



Fig. 21.—School children applying for hookworm treatment in Salvador. Pupils must be hookworm-free to enter school

absent from work because of sickness. During the same three months of the following year, after the hookworm campaign, only twenty-six men were laid off for this reason,—a reduction of 42 per cent. Another manager reported that previous to the time treatment was given his laborers, between 150 and 200 of them were absent from work daily during the rainy season. In 1918, after treatment had been administered, the number daily absent from work during the rains never exceeded sixty, and usually was considerably less than this figure.

Effect of the Disease on the Birth Rate. It is probable that hookworm disease has a deterrent effect upon the birth rate. Not only do the sterility and impotence commonly caused by the infection reduce the frequency of conception, but the effects of the disease, falling most heavily on women of child-bearing age, cause a large proportion of the pregnancies that do occur to terminate in abortions or miscarriages. Wherever treatment is carried out over large areas, the birth rate is stimulated in marked degree. Many women become pregnant who have not borne children for years. The regularity of menstruation is restored, sterility reduced, the number of pregnancies correspondingly increased, and the proportion of unfavorable terminations reduced. This is a fact of vital economic significance in view of the present shortage of man-power throughout the world.

MENTAL RETARDATION

During 1918 the Ministers of Public Instruction in Nicaragua and Salvador issued decrees calling for the examination of all school children for hookworm disease and for the treatment and cure of those infected; and the Prefect of the Federal District of Brazil, similarly, ordered the examination and treatment of the pupils in the public schools of the city of Rio de Janeiro. These acts were prompted by recognition of the fact that aside from its baneful influence in retarding physical development, hookworm disease causes a further loss to the state by impairing the intellectual character and capacity of its citizenship.

Comparative Scholarship Gradings of Infected and Non-Infected. Lists of the children found infected usually correspond with those of the dullest pupils in their grades. In one women's college in the Southern States, for example, the average standing of fifty-six students found infected was 78 per cent, whereas fifty-six students found free of infection averaged 89 per cent. In another instance, twenty-five infected boys in a Southern academy averaged 64 per cent in their studies, as compared with the percentage of 86 maintained by the same number of non-infected boys. Here the retardation was approximately 25 per cent. Teachers everywhere

are practically unanimous in reporting that treatment of the infected pupils results not only in marked gains in weight and physical appearance, but in decided improvement in zeal and intelligence as well.

Mental Retardation from Hookworm Disease in U. S. Army.

Major Kofoed reports, on the basis of his experience with hookworm disease among troops in the Southern Department of the United States Army, that when the findings of the hookworm survey were compared with those of the psychological board in the case of 10,000 men at Camp Travis, Texas, the mentality of white men with hookworm disease was found to be about 33 per cent below the mentality of those without it.

Study of Mentality of Infected Children in Queensland.

During 1918 a thorough investigation was made of the mental retardation due to hookworm infection among the school children of Queensland, Australia. The study was made possible by the Queensland Department of Public Instruction, which provided a school nurse for six months and all necessary facilities for carrying out the work. Three hundred forty children between the ages of six and fourteen years were selected for mental testing. As far as possible, effort was made to obtain a fair representation of the 5,000 or more school children residing within the areas visited, both as to strata of society and the sections of town or country from which they came. The children selected fell naturally into one of three groups, according as microscopic examination of the fecal specimens which they submitted showed that they were not infected, only lightly infected, or heavily infected with hookworm disease.

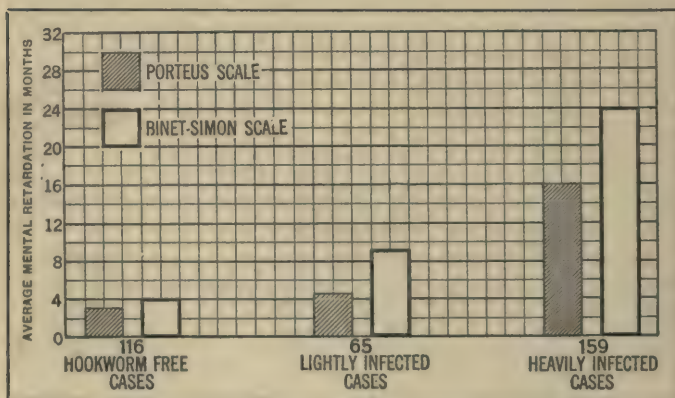


Fig. 22.—Comparative mental retardation, in months. Hookworm free, light hookworm infections, and heavy hookworm infections. Three hundred forty school children of Queensland, Australia. 1918

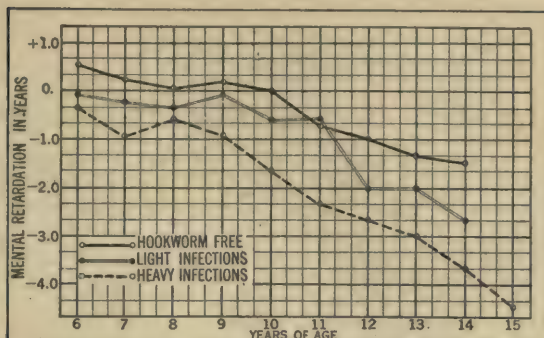


Fig. 23.—Results of Binet-Simon mental tests by age groups. Three hundred forty school children. Queensland, Australia. 1918

Measures of Mentality Employed in Queensland Study.

The method of selection on the basis of stool examinations kept a constant factor of other causes of retardation, such as hereditary mental defects, syphilis transmitted from parents, parental alcoholism, tonsils and adenoids, and so forth. The tests were applied by the nurse, without knowledge as to what result the microscopic examination of the child's feces had yielded. Goddard's revision of the Binet-Simon tests, the Porteus mazes, and a special modified dot-counting test were employed in gauging the mentality of the children. In using the Binet-Simon tests, special adjustments were made to adapt them to Australian children. From thirty-five to forty minutes were taken for applying the tests to each child.

Findings of Queensland Mental Retardation Study. Figs. 22 and 23 exhibit graphically the principal facts disclosed by the survey. Lightly infected cases had, on the average, a retardation of 9.3 months in their mental development as measured by the Binet-Simon tests, and of 4.9 months as measured by the Porteus; while heavily infected cases were retarded 23.4 months as measured by Binet and 16.6 months as measured by Porteus. The longer the infection had persisted in the child, the greater was the retardation found to be. Thus, in infected children eight years old the retardation was only 6.6 months, while in those eleven years old it was 19.0 months and in those fourteen years old, 25.9 months. In extreme cases accompanied by the most severe types of individual infection, a retardation of as much as five years was recorded.

III

DIAGNOSIS OF HOOKWORM INFECTION

Work for the relief and control of hookworm disease, to be of the greatest value, must be conducted in such manner that its benefits may not only reach the more advanced and prosperous peoples, but also extend to the many millions of primitive folk who inhabit the more remote and inaccessible regions of the earth. This means that field activities must often be carried out under conditions far from ideal. In all of the work the aim has been to achieve accuracy and simplicity. If the latter requirement is to be met, the apparatus and equipment cannot be elaborate, nor should extensive preliminary training on the part of the examiners be necessary. At all times the cost of the work must be kept within the means of the masses.

Methods of Diagnosing the Infection. The disease may be diagnosed by administering a vermifuge and searching the stools for hookworms, or the vermifuge may be omitted and specimens of feces may be microscopically examined for ova. It has been customary to rely almost entirely upon several variations of the latter method. There are also various culture methods for demonstrating the infection, but these are hardly practicable for extensive use in the field.

How Fecal Specimens are Received and Examined. When microscopic examination of the feces is the basis for demonstrating the disease, every person in an infected area who desires to know whether he has hookworm disease is invited to submit a specimen of his feces for examination. For this purpose small tin boxes about one inch in diameter, with the lid of each properly marked for identification, are supplied. Every effort is made to insure careful and accurate diagnosis of the specimens submitted. In each country the examiners are native young men who have been especially selected for their reliability and later trained in the detection of ova. The specimens found negative by one man are in almost all cases re-examined by one or two others, and head examiners are usually employed to watch over the work and safeguard the accuracy of the results.

MICROSCOPIC DIAGNOSIS WITH PLAIN SMEAR

Until 1914 the plain smear method of microscopic examination was used almost exclusively. This consists of the careful search of not less than three smears from each specimen before pronouncing free of infection the person who submitted it. The glass slides on which the smears are examined measure not less than one by three

inches. The disadvantage of this method lies in the fact that it requires more time for thorough examination than can be devoted to each specimen. Furthermore, the specimens themselves are too small to yield entirely trustworthy results. Nevertheless the method is fairly satisfactory when large or moderate numbers of the parasites are harbored.

DIAGNOSIS WITH THE AID OF THE CENTRIFUGE

When only a few worms are in the intestines, the number of eggs in the feces is, of course, correspondingly reduced. It then becomes necessary to employ a ready means of concentrating the eggs, not merely to facilitate the search but also to assure a greater degree of accuracy in the findings. In recent years a multiple-tube hand centrifuge, which goes far toward meeting these needs, has come into general use. When this machine is employed, two or three slides from each specimen are first examined by the ordinary plain smear method. Those specimens which seem to be negative by this process are set aside and centrifuged in groups of twenty; and from the concentrated sediment thus obtained, two or three slides are usually prepared from each specimen for further examination with the microscope. Experiments have shown that the number of specimens found positive is about twenty per cent higher when the centrifuge is used than when the ordinary plain smear method alone is relied upon for diagnosis.



Fig. 24.—Special type of hand centrifuge used in examining specimens.

(Top) Stewart panhead, with specimen tubes in position

(Bottom) Shaft, showing manner of clamping to table

Accuracy of Centrifuge Method. The accuracy of the centrifuge method, like that of the plain smear method, depends primarily upon a fecal sample that is too small to yield entirely trustworthy results. The Board's Uncinariasis Commission to the Orient found, in the Federated Malay States and in Fiji, that when the same groups of persons were examined first by the centrifuge method and

later by administering a vermifuge and straining the stools for worms, the microscope showed only from 75 to 85 per cent of the persons examined to be infected, while diagnosis by vermifuge revealed from 97 to 100 per cent. It seems well within conservative bounds to estimate that in examinations both before and after treatment, diagnosis by microscopic examination, aided by the centrifuge, yields evidence of infection varying from 4 to 25 per cent less than actually exists. In support of this statement the evidence afforded by experiments made in Brazil during 1918 may be cited.

Summary of Experiments in Brazil during 1918. One hundred two among the total of 280 test cases treated in Brazil during 1918 were reported negative on original microscopic examination, giving a percentage of infection of 63.9. All 102 of the negative cases were later treated and fifty-six of them expelled worms, thus indicating that the actual rate of infection was not less than 83.6. All of the original examinations were made by trained microscopists with the aid of the centrifuge, yet the result shows a difference of 19.7 per cent in favor of diagnosis by vermifuge. The fifty-six cases incorrectly diagnosed yielded 716 worms, or thirteen per infected case. One of the cases declared negative on microscopic examination expelled as many as 115 worms.

GLYCERINE-SALT PROCESS OF EXAMINATION

It seems that infections which escape detection by the combined plain smear and centrifuge methods represent cases which harbor comparatively few worms. Nevertheless it is of considerable importance that these mild infections should be correctly diagnosed.

Two special techniques of examination have lately been developed to meet this need: the glycerine-salt and the brine flotation-loop methods. Both make use of specific gravity as an aid in correct diagnosis. The former was developed by Dr. M. A. Barber in his work in the Federated Malay States and was used by the medical officer in charge of the work in Siam in examining 31,298 specimens in that country up to December 31, 1918. The results obtained from its use are reported to be extremely satisfactory.

Process of Examining by Glycerine-Salt Method. In using the glycerine-salt technique, a diluting fluid composed of equal parts of a saturated solution of magnesium sulphate and glycerine is prepared. This fluid is dropped from a large dropping-bottle into the small tin box which contains the specimen. The fecal mass is thoroughly stirred and broken up with a toothpick, which releases the ova and causes them to rise to the surface. The upper part of the fluid in each container is poured upon a two-by-three-inch glass microscope slide which has been rimmed with paraffin or grease, and



Fig. 25.—Boys of Kampong Bharu, Federated Malay States. Hookworm incidence by ova examination, 86.6 per cent; by vermifuge, 100 per cent

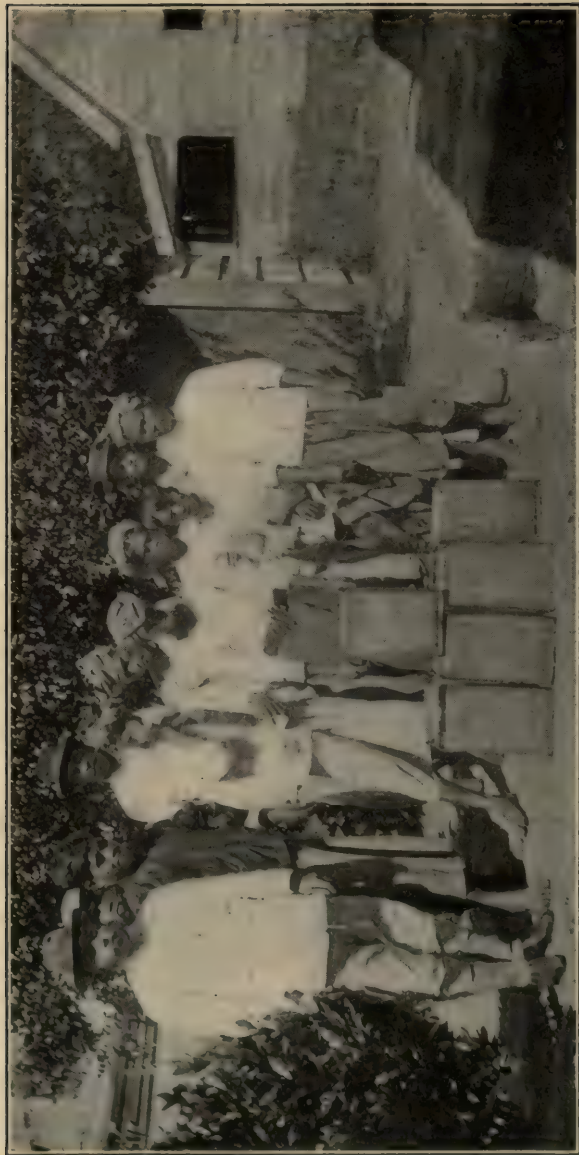


Fig. 26.—Collection of feces from Javanese patients prior to counting of worms. Dutch Guiana

the surface of the slide is searched for eggs. The entire contents of a container may be examined by preparing three or four of these slides. The process regularly followed is to examine two slides before and two after centrifuging the specimen. The glycerine-salt diluting fluid is used in preparing all four of the slides, including those made before as well as after centrifuging.

Advantages of the Glycerine-Salt Method. The number of ova brought upon the slide by the glycerine-salt method is so greatly increased that the eggs may be much more easily found than when the plain smear method is used. This reduces the number of specimens that have to be run through the more time-consuming process of centrifuging and results in a great saving of time. This is an especially important consideration in regions like Siam, where the individual infection is so mild that when the plain smear method is used it is often necessary to prepare from ten to twelve slides from a single specimen and to spend from twenty to thirty minutes in order to make a diagnosis.

Comparative Accuracy of Plain Smear and Glycerine-Salt Methods. Forty-five test specimens were examined personally by the director of the work in Siam, using first the plain smear and then the glycerine-salt method. Two slides from each specimen were examined by both methods; in neither case was the centrifuge used as an aid. The percentage of persons found infected in examinations by the plain smear method was 23.3 on the first and 12.2 on the second slide, or 35.5 for the two slides combined. By the glycerine-salt method it was 84.4 on the first and 2.2 on the second, or 86.6 for both slides. With the plain slide technique a total of thirty-six ova were found on all ninety of the slides examined; with the glycerine-salt technique, a total of 4.48.

A later series of forty-three specimens was examined by the two methods, but a second slide was prepared only when the first proved negative and no record was kept of the number of eggs discovered. In this series the percentage found positive by the plain slide method was 37.2, as compared with 67.4 by the glycerine-salt method. For both series, embracing eighty-eight specimens in all, the percentage of positive findings by the two methods was 27.5 and 77.2, respectively.

Accuracy of the Plain Slide, Centrifuge, and Glycerine-Salt Methods Compared. Twenty-seven of the eighty-eight specimens just mentioned were examined in rotation by the plain slide, centrifuge, and glycerine-salt methods. In this series, record of the number of ova discovered was omitted and a second slide was not prepared if the first proved positive. The results showed that the glycerine-salt was the most accurate of the three methods. The findings were as follows: 40.7 per cent positive by the plain slide, 55.5 by the centrifuge, and 70.2 by the glycerine-salt method.

BRINE FLOTATION-LOOP METHOD OF EXAMINATION

During 1918 Majors Kofoid and Barber developed a special technique known as the "brine flotation-loop method," and employed it in examining for hookworm disease the soldiers in the Southern Department of the United States Army.¹ This method is in part an outgrowth of experience with the glycerine-salt method just described, and in this respect may be accepted as an improvement over that technique. In the army medical work it was used by about seventy-five examiners in making more than 100,000 examinations under field conditions, and was found to be rapid, efficient, practicable, and especially valuable in diagnosing light infections.

Technique of Examination with Brine Flotation-Loop Method. The process followed in making examinations by this method is to mix a large fecal sample thoroughly in concentrated brine in a paraffin paper container of from 50 to 75 mls (two to three ounces) capacity. The coarse float is forced below the surface by means of a disk of No. 9 steel wool and the container is allowed to stand one hour for the ova to ascend. The surface film is then wiped off with wire loops one-half inch in diameter and examined on a slide without a cover glass. The ova of hookworm and of other parasites are floated up by the brine into the surface layer of the pool without distortion or noticeable change in appearance.

Advantage of Flotation-Loop Process. The great advantage of this method is believed to lie in its easy utilization of large samples. With containers of sufficient size, receptacles for mixing the entire stool may be employed. This eliminates the element of random sampling except in so far as this may be due to irregular egg-laying by the female worms or to an unequal discharge of eggs in successive stools. It insures also a sufficient number of ova to make detection possible in light infections which may be overlooked by other methods using smaller samples. It is for this reason a more accurate means of diagnosis. In addition, it is reported to be about 50 per cent more rapid than the centrifuge method.

Accuracy of Flotation-Loop Process. The accuracy of this method depends on a number of variables, including the size and consistency of the specimen, the thoroughness of stirring, the amount of steel wool used, the care in looping, the opacity of the fluid, and the extent and thoroughness of the search made of the material on the slide. Eight lots of fifty specimens each, which had been examined once, were set aside and subsequently re-examined for the purpose of ascertaining what proportion of light infections had escaped detection. The specimens were all from companies of soldiers in

¹ For full particulars, see article entitled "Rapid Method for Detection of Ova of Intestinal Parasites in Human Stools," by Charles A. Kofoid and Marshall A. Barber, *Journal American Medical Association*, vol. 71, No. 19, p. 1557.

which there was light and therefore presumably easily-overlooked infection, and all had been found negative on the first examination. The top float of each lot of fifty cans was drawn off into a tall cylindrical liter graduate, and the surface film of this column examined. The cans had stood, after stirring, for not less than two or three hours. In order to avoid entangling any ova that might be present, no brine from thick or viscous stools was used. Only one specimen among all eight lots, or one in four hundred negatives, was found positive on second examination. From this it appears that the number of positives escaping detection by this method is practically negligible.

IMPRACTICABILITY OF SCIENTIFICALLY EXACT DIAGNOSIS

When a person is declared free of infection on microscopic examination, the term is used in a relative sense to indicate that the number of worms in the intestines is so low that no ova can be discovered in the feces. This does not necessarily mean that there is not a single hookworm present. Male worms may still be harbored, as there is no possible way of knowing that there are none of these except by administering repeated treatments and washing the stools after each treatment. Nor is it possible to say that not a single female worm inhabits the intestinal tract unless specimens of stool are examined every day for many days. But it can be stated definitely that if careful examination by the methods in use fails to show the presence of ova, the number of worms remaining is very small. If patients were willing to submit two or three specimens for examination, the removal of every parasite could be more definitely predicted, but this would entail a large amount of additional work and present many difficulties if attempted under field conditions.

IV

METHODS OF TREATING HOOKWORM DISEASE

The treatment of hookworm disease is gradually becoming standardized. It is now generally agreed that a purgative and a vermifuge are required. The purgative is usually administered in two portions, the first being given before and the second after the vermifuge has been taken, though some authors do not regard the preliminary purge as necessary. Most authorities state, however, that the first purgative dose is useful in eliminating the mucous and other substances which surround the worms in the intestines and protect them from the action of the vermifuge. The latter is supposed to kill or poison the worms and cause them to release their hold on the intestinal wall. A second dose of the purgative is then administered to sweep the worms and the vermifuge from the intestines.

Drugs Used in Treatment. The principal remedies used are chloroform, eucalyptus, beta-naphthol, thymol, and oil of chenopodium. A new drug known as *carvacrol* was tried during 1918, but the results attending its use were reported as unsatisfactory. Of the five drugs most extensively employed, thymol and oil of chenopodium have proved themselves superior to all the others under field conditions. Chenopodium during recent years has been gaining steadily in favor as a remedy for hookworm disease.

Properties of Chenopodium Not Fully Understood. It seems, however, that there are on the market a number of varieties of this drug which differ greatly in their strength and toxicity. The variations in different samples are especially noticeable in the chemical composition of the oil, and are exhibited in its appearance, taste, smell, specific gravity, and volatility. A better pharmacopoeial standard seems highly desirable. Thorough investigation of the cultivation of the plants from which the oil is distilled, of the pharmaceutical preparation of the oil, and of its properties after distillation, is required to assure a uniform and standard product and a safe routine of administration. The tests should also include, among other things, a careful and detailed investigation of the effect of the drug not merely on animals but on adults and children of different ages and in varying states of health. Although during 1918 scarcely any untoward results were reported by the United States army medical service or in the Board's work, yet it is believed desirable to repeat the earlier caution, that in giving the oil to children the dose should be made smaller than is indicated by Young's rule, and that medical officers should exercise careful supervision over the administration of the oil in the field.

STANDARD TECHNIQUE OF THYMOL ADMINISTRATION

The routine dosage of thymol recommended by Stiles, Dock, Howard, Bass, and others of wide experience in the treatment of hookworm disease, is the one most commonly employed in the countries where thymol is used. It is based upon sixty grains as the maximum for an adult, preceded and followed by an active saline purgative. Children from one to five years of age receive from 3 to 5 grains of the thymol; those from six to ten, from 10 to 15 grains; and those from eleven to fifteen, from 15 to 30 grains. Persons between sixteen and twenty years of age receive from 30 to 40 grains; those between twenty-one and fifty years, from 45 to 60 grains; and those more than fifty years, from 30 to 45 grains. The drug is administered in two equally divided portions, and apparent (not actual) age determines the dosage. Competent physicians examine all patients who are to take the drug, prescribe the proper dosage for each, and supervise the important phases of the treatment.

Conditions Governing Administration of Thymol. Food is not allowed from the time of the first purgative until after the final dose of salts has acted. Inasmuch as alcohol and oils, and gravy, butter, milk, or other fatty foods, are especially dangerous, the patient is cautioned against taking them at any time during the period of treatment. Under field conditions it is also necessary to withhold thymol from persons suffering from acute diseases such as malaria in the febrile stage or fevers of any other type; those having chronic dysentery or diarrhea, organic cardiac or renal disease, pulmonary tuberculosis beyond the incipient stage, or general anasarca; those who are extremely weak or feeble from old age or from other cause; and pregnant women, or women with serious hemorrhagic diseases of the uterus. Thymol may be administered to persons suffering from any of these diseases only when the circumstances will permit rigid control of all features connected with the treatment.

USE OF CHENOPODIUM AS AN ANTHELMINTIC

Oil of chenopodium is now used more extensively than thymol in all countries with which the Board co-operates except Panama, British Guiana, Trinidad, and Saint Lucia. Its comparatively low cost and the relative scarcity of thymol brought about by the World War have doubtless been factors in some measure leading to its widespread use. Following the reduction in dosage recommended by the Board's Uncinariasis Commission to the Orient, the drug was employed in administering 437,166 treatments to 191,377 persons during 1918, and gave exceptionally favorable results.

STANDARD METHOD OF ADMINISTERING CHENOPODIUM

The standard method of administering chenopodium as used by the Board during 1918 was that recommended by Darling, Barber, and Hacker as a result of their experiences with various vermifugal drugs in the Orient and published in their article entitled "The Treatment of Hookworm Infection."¹ It consists of an adult dose of $1\frac{1}{2}$ mils (by weight),² divided into three equal parts and administered the first portion at 7:00 a.m., the second at 8:00 a.m., and the third at 9:00 a.m. A light evening meal followed by a purgative dose of magnesium sulphate is usually given on the evening preceding treatment, and a very light breakfast, consisting of milk or thin rice gruel, on the morning of treatment. Two hours after the last portion of chenopodium is taken, a second purgative dose of magnesium sulphate is administered. Effective post-treatment purgation is thought to be essential to eliminate the dead or stunned worms and the unabsorbed oil. A second post-treatment purgative should be given if the first fails to act freely and promptly.

Schedule of Dosage for Children and Adults. The directors of the work in Ceylon, who have made extensive use of the drug in small doses, have worked out a dosage table for children and adults. Children who *appear* to be between the ages of two and twelve years receive 1 minim for each year of age, minus 1 minim. This means that a child of seven receives 6 minims, a child of six 5 minims, and so on. Persons from thirteen to fourteen years of age receive 13 minims; those from fifteen to sixteen, 16 minims; from seventeen to eighteen, 20 minims; and from nineteen to twenty, 24 minims. It will be noted that especially small doses are administered to children under twelve. The oil is dropped from a dropping-bottle into simple sugar syrup. In Ceylon this has proved the most satisfactory of all the vehicles in which the oil has been administered. The directors of the work in this country also report that in addition to the contraindications to thymol treatment mentioned on page 139, the use of chenopodium is contraindicated when the patient has peptic ulcers or gonorrhea.

Efficiency of Standard Chenopodium Treatment. The director and the assistant director of the newly established Department of Hygiene at the University of Sao Paulo, assisted by the staff engaged in hookworm control measures in Brazil, made considerable progress during the year toward establishing the probable average efficiency of the foregoing dosage under field conditions. In the original experiments, made in the Orient under laboratory conditions,

¹ The Journal of the American Medical Association, February 23, 1918, Vol. 70, pp. 449-507.

² Special attention is directed to the fact that a minim by weight equals approximately 2 drops by measure.

two standard chenopodium treatments, separated by an interval of ten days, removed 99 per cent of all the hookworms harbored by a group of thirty-nine adults. One hundred fifty-six cases were similarly treated in Brazil during 1918, except that the work was done largely under field conditions, and 97 per cent of the worms they harbored were removed. Thus the Brazilian experiments confirmed, in so far as the smallness of the numbers involved may be accepted as confirming, the tests made in the Orient. A large amount of additional field experience will need to be gained, however, before the entire practicability and efficiency of the routine treatment may be regarded as definitely established. One of the factors remaining for further investigation is the apparent difference in power of resisting treatment between the *Ancylostome* and the *Necator americanus*, and between persons who harbor large numbers of worms and those who harbor only a few.

a. Experiments with standard technique among Brazilian vagabonds.

Eighty-two vagabonds more than fourteen years of age, who lived at an institution in Pinheiro, in the State of Rio de Janeiro, were treated three times with chenopodium. The first two treatments consisted of $1\frac{1}{2}$ mls each and the third of 3 mls.¹ These treatments expelled a total of 10,895 worms. Fig. 27 shows the efficiency of each treatment as based on two factors: the percentage of worms expelled and the percentage of cases cured. In this group there were only nine relative failures of the treatment, or cases which harbored ten or more worms after two $1\frac{1}{2}$ mls treatments had been taken. The conditions of this experiment, however, permitted a rigid control of the patients and approached the exactness of a laboratory test. The results, therefore, may not be accepted as altogether representative of those to be expected when the remedy is administered in the field.

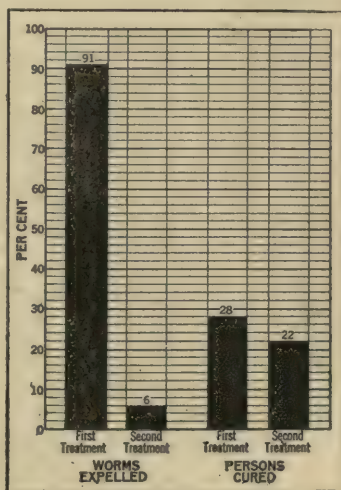


Fig. 27.—Worms expelled and cases cured by two treatments of chenopodium. Eighty-two Brazilian vagabonds.

¹ The third treatment (consisting of 3 mls) is not, of course, a part of the routine chenopodium administration. It was given to assure the quick recovery of all the hookworms harbored. Under ordinary conditions a dose of this size is not without its dangers.

b. Tests on heavily infected farm and in lightly infected village. Two trials were made in Atibaia, Brazil, to determine the efficacy of the standard treatment as administered under field conditions by regular campaign dispensers. In the first test, two localities were chosen: a severely infected farm and a mildly infected village. Ten persons in each locality were selected for the test. All received two routine treatments of chenopodium from the dispensers. Two weeks after they had taken the last of these two treatments, they were given a large 3 mils test dose of chenopodium. In the farm group there still remained 134 worms, or 13 per case, after the first two $1\frac{1}{2}$ mils treatments had acted; in the city group, 7, or .7 per case. There were 50 per cent of relative failures among the farm residents. The number of worms harbored by this group before treatment was undoubtedly high, however, as two controls on the same farm who, before receiving the 3 mils dose, had been treated only once with $1\frac{1}{2}$ mils, expelled as a result of the second treatment an average of 148 worms apiece.

c. Experiments on typical coffee farm. In the third experiment fifty-six persons living on a large, typical coffee plantation in the State of Sao Paulo, Brazil, who had already been treated twice in the routine way by campaign dispensers, were given, twelve days later, a single large dose of chenopodium. These cases were found to harbor, on the average, 5.8 worms per case after they had taken the first two treatments, while four control cases treated for the first time averaged 176 worms per case. In 41 per cent of the cases every worm was expelled by the first two treatments; in 21 per cent there was relative failure of the drug.

Interval Between Treatment with Chenopodium and Re-examination. Chenopodium has a distinctly inhibitory effect upon the egg-bearing functions of the female hookworm. A series of test cases conducted during 1918 by a special nurse in the city hospital of Sao Paulo showed that after treatment with chenopodium the ova disappeared from the feces and, if the cases were not cured, re-appeared the eighth to thirteenth day. This confirmed the findings of earlier investigators. All who have studied the subject agree that re-examination should be made in not less than fourteen days after the vermifuge has been taken. This is the period customarily allowed in the countries where chenopodium is used.

Need of Satisfactory Purgative for Use with Oil of Chenopodium. None of the purgatives which have been employed in connection with chenopodium treatment have given entirely satisfactory results. Of those which have been tried, magnesium sulphate is the one which has been reported upon most favorably.

Omission of Preliminary Purge. Better results are apparently obtained if the pre-treatment purgative is given; and in hospital practice, where the patient can rest and is under constant observa-

tion, it seems best to give it. But when it is given in field work, many of the patients, after it has acted, become weak and in some instances are unfit for work next day, with the result that they lodge complaints against the treatment. The original experiments of Darling, Barber, and Hacker, although dealing with a number of cases too small to enable trustworthy conclusions to be drawn from them, nevertheless showed that when this purge was omitted and the other factors were kept the same as in routine treatment, two standard doses of $1\frac{1}{2}$ mils of chenopodium cured 80 per cent of the cases and removed 95 per cent of the total worms. This suggested that with an interval of twelve hours between eating and the administration of the vermifuge, the preliminary purge might be omitted.

CHENOPODIUM-CROTON OIL TREATMENT AS DEVELOPED IN CEYLON

In Ceylon a special form of treatment which omits the preliminary purge, has been developed and is now being extensively employed in estate and village work. It is unquestionably more acceptable to the patients. Some of its best features are that smaller doses of salts are required to secure effective post-treatment purgation, there is less exhaustion, the after-effects—consisting of rheumatoid pains, tinnitus, etc.—are much less in evidence, and in almost all cases the patients are able to work the following day.

Routine Administration of Chenopodium-Croton Oil.

When this method is employed, a light meal of rice gruel is allowed the evening before treatment. At 6:00 o'clock next morning a small cup of konje is taken. At 6:30 a.m. the vermifuge (a mixture of chenopodium 40 parts and croton oil 1 part) is given in the standard dosage prescribed for chenopodium (see page 140), graduated according to the apparent and not the stated age of each person. The dose is usually given in two equal parts with an interval of one hour between. Two hours after the whole of the vermicide has been taken, the patient receives a purgative dose of magnesium sulphate.

Conditions Governing Chenopodium-Croton Oil Treatment.

All patients are kept under observation by the dispenser from the time of giving the first portion of the vermicide until the medical officer in charge is satisfied that the post-treatment purgative has acted freely. Meanwhile, the patients are allowed to rest in a sheltered place. Temporary sheltered latrines for men and women are provided near the resting-place, and an apothecary or dispenser sees that the latrines are properly used. Before the patients are discharged, they are strongly counselled not to eat raw fruit or vegetables for a day or two after treatment, but to take chiefly rice and rice gruel.

ADMINISTRATION OF CHENOPODIUM IN UNDIVIDED DOSES

In an experiment conducted by the Uncinariasis Commission to the Orient, 2 mils of chenopodium administered in two equally divided doses removed 96.2 per cent of the worms harbored by eight cases, while the same amount of the drug administered in a single massive dose expelled 95.8 per cent of the worms in twenty-five other cases. The similarity of these figures suggested that it was probably unnecessary to divide the dose. Experiments to determine this point were made by the directors of the work in several countries during 1918.

Experience in Seychelles Islands and in Ceylon. The medical officer in charge of the work in the Seychelles Islands administered to a limited number of cases the full daily dose of chenopodium at 6:00 a.m., without preliminary purgation, but the results obtained were not so good as when the regular routine of chenopodium treatment was followed. In Ceylon, similarly, the entire amount of chenopodium in one dose was administered experimentally on a number of estates. The method is still under trial, but the directors report that it does not appear suitable for use where there is heavy infection.

Experience in China. The director in China, on the other hand, has made extensive use of a single 2 mil dose, and in a group of experimental cases obtained satisfactory results, the percentage of cures after one treatment being approximately 87.0. The experience in that country indicates that chenopodium in this dosage is seldom contraindicated. Persons with active tuberculosis, moderate heart lesions, and acute bronchitis have been treated and have shown no ill-effects. It should be pointed out, however, that all the patients dealt with are male adults between eighteen and fifty years of age, and that the doses of salts used are larger than are customarily administered in other countries.

EFFECT OF PURGATIVE ON EFFICIENCY OF REMEDY

Tests made in China during 1918 suggest that the rôle played by the purgative in removing the worms from the intestines, and the full effect of chenopodium on hookworms, considered from the therapeutical standpoint, are two extremely important phases of treatment which have perhaps not been sufficiently investigated. It was noticed that the percentage of living worms expelled was increased if the salts acted quickly. This meant either that longer

contact with chenopodium kills a larger percentage of worms, or that in many cases the drug temporarily loosens the hold of the worm on the intestinal wall so that a strong purgative may expel many living worms. A series of observations was then made to ascertain what effect an increase in the dose of magnesium sulphate had on the percentage of cures.

Increased Efficiency of Chenopodium with Free Purgation.

The amount of chenopodium used was an undivided dose of 2 mls. At first 25 mls (one ounce) of magnesium sulphate was administered the evening before treatment, and 50 mls two hours after the chenopodium had been taken. Of 395 infected persons treated by this method, 286, or 72.4 per cent, were found negative after one treatment. The results were so good that the amount of salts was increased to 50 mls instead of 25 on the evening before treatment, and to 141 mls (four and two-thirds ounces) instead of fifty after the taking of the chenopodium. The salts given after the vermifuge were divided into two portions, one-half being administered at the end of two hours and the other half at the end of four. Of 620 persons treated in this way, 499, or 80.5 per cent, were found negative after one treatment. With the increase in the amount of salts given, there was not one case which showed any symptoms of chenopodium absorption. There were nausea and vomiting at times, but there were no ill effects due to the action of chenopodium.

USE OF CHENOPODIUM IN TREATMENT OF AMEBIC DYSENTERY

In a number of countries oil of chenopodium is now being regularly employed in the treatment of dysentery. It is reported to remove encysted ameba, to cause the disappearance of blood and mucus from the feces, and to give prompt relief to the patient.

Routine Chenopodium Treatment for Relief of Dysentery.

In Siam the treatment is used as follows: 37 mls (one and one-half ounces) of magnesium sulphate are first given. Two hours later 1 mil of oil of chenopodium follows. One hour later a similar dose of the oil is administered, followed in another hour by 37 mls (one and one-half ounces) of castor oil. For more severe cases either the preliminary purgative is omitted and 2 mls of chenopodium in 37 mls of castor oil are given in a single dose, or 1 mil of oil of chenopodium, emulsified with gum acacia, is administered by way of the rectum. In the latter mode of treatment the anal mucosa is protected by petrolatum and the injections are terminated with 50 mls (two ounces) of an inert oil. The buttocks are elevated, and the enema—the first dose of which does not exceed 200 mls (eight ounces) for an adult—is given slowly.

MANNER OF DETERMINING RELATIVE EFFICIENCY OF DRUGS

The proportion of infected persons cured by two treatments does not always convey an adequate idea of how efficient a remedy is. Two treatments of a powerful vermicide may remove from a large proportion of cases all but two or three per cent of the worms they harbor, and still fail to effect the complete cure of any considerable number of the patients. Thus, in a series of experimental cases, two treatments of chenopodium, each consisting of $1\frac{1}{2}$ mls, have expelled more than 95 per cent of the hookworms harbored and yet cured only from 40 to 50 per cent of the cases. To effect the complete cure of all infected persons required, on the average, four treatments of the drug. This meant that the additional two treatments were used to expel less than 5 per cent of the worms originally harbored.

Efficiency as Estimated by Percentage of Worms Removed.

For judging the efficacy of a drug the percentage of worms expelled is a better criterion than the percentage of cures obtained. It affords a satisfactory measure of efficiency in districts where there is moderate or severe infection distributed with a fair degree of uniformity among various classes of the population. But where the infection is mild and there are a few carriers with a disproportionately large number of worms to dominate the results, its value is not so great. One of the chief advantages of the method lies in the fact that the

CASE NO	WORMS HARBORED	WORMS REMOVED BY TWO TREATMENTS	PERCENTAGE OF WORMS REMOVED BY TWO TREATMENTS
1	64	48	75.0
2	195	193	99.0
3	873	461	52.8
4	1227	498	73.2
5	439	439	100.0
6	93	27	29.0
7	291	120	41.2
8	686	678	98.8
TOTAL	3868	2864	74.0
Percentage of Worms Removed from Group-----			$\frac{2864}{3868} = 74.0$
Average Percentage of Worms Removed from Each Individual*			$\frac{569.0}{8} = 71.1$
Knowlton's Index of Efficiency-----			$\frac{74.0 + 71.1}{2} = 72.6$
* Addition of Figures in column headed Percentage of Worms Removed by Two Treatments, divided by the number of cases treated.			

Fig. 28.—Method of computing Knowlton's index of efficiency

worm count is a positive finding, all errors tending to decrease the apparent efficiency of the drug; while in estimating efficiency by cures, all errors of omission, due to faults inherent in the methods of diagnosis followed, tend to enhance the apparent value of the remedy by fictitiously increasing the number of cases registered as cured.

Knowlton's Method of Determining Efficiency. By adding the percentages of worms removed from each member of a group of infected individuals and dividing the total of these percentages by the number of individuals comprising the group, a fairly good index may be obtained. This is open to the objection, however, that the case with one worm counts for as much as the one with a thousand. Knowlton therefore recommends combining this method with the one whereby efficiency is determined on the basis of the percentage of worms removed from the group. The two percentage figures thus derived are averaged, and a figure obtained that is believed to give the most satisfactory index of efficiency of any method yet evolved. Fig. 28, page 146, illustrates this method of obtaining the efficiency index as applied to a supposititious group of eight cases.

V

HOOKWORM INFECTION SURVEYS

The Board's participation in measures against hookworm disease in any state or country is contingent upon official invitation from Government. As a preliminary step to the arrangement of a definite program, it is customary for an infection survey to be made of the territory. This survey defines the geographical prevalence and distribution of the disease and the practicability of its control, makes available data concerning the insanitary conditions which are responsible for the presence and spread of the infection, and furnishes information relative to the public health or other agencies through which systematic efforts against the disease may be begun with greatest promise of success. Thus it gives to Government and to the Board definite information upon which a satisfactory working agreement may be based. This information is also of much assistance when the measures designed to reduce the incidence and severity of the disease are put into operation.

Infection Surveys Completed or Authorized. During 1918, three complete infection surveys were concluded. One of these was in the State of Sao Paulo, Brazil, another in Jamaica, and the third in the United States Pacific possession, Guam. A fourth survey, begun in June in Minas Geraes, one of the largest states in Brazil, had not been completed by the end of the year. Other surveys were authorized but not begun during the year in the Brazilian States of Bahia, Parana, and Maranhao, and in the Province of Madras, in India.

INFECTION SURVEY OF JAMAICA

The infection survey of the Cayman Islands (a dependency of Jamaica) made during the spring of 1917, resulted in the Government's appropriating approximately \$12,000 for carrying out a co-operative campaign against the disease in Jamaica proper. As an initial step in the measures of control an infection survey of the Island was made during June and July of 1918.

Findings of the Survey. The survey indicated that probably two of every three inhabitants of Jamaica have hookworm disease. The distribution of the infection by parishes is roughly indicated by the accompanying map (Fig. 29). High infection rates were also recorded for round-worms and thread-worms, the former being found in 67.2 per cent of the 10,926 persons examined and the latter in 35.9 per cent. In the larger towns and cities, which are located on



Fig. 29.—Hookworm infection survey map of Jamaica

the coast, a beginning has been made toward the proper disposal of excrement, but in the rural districts soil contamination is practically universal. There are laws requiring a latrine at every home, but no serious attempt has been made to enforce them.

Inauguration of Control Measures. The survey is to be followed by a series of demonstrations in control measures. The working arrangement provides that Government is to share the expense of the initial field posts and to have suitable latrines installed in all areas in advance of examination and treatment. Government has made available approximately \$7,500 as a first appropriation for this purpose.

PREVALENCE OF HOOKWORM DISEASE IN GUAM

At the request of the Surgeon General of the Navy, a hookworm infection survey of Guam was made in May, 1918. Microscopic examination of 857 natives resident in various parts of the Island, representing 7 per cent of its total population, showed 71 per cent to be infected. The disease is relatively mild in type. No cases were found in which the infection was severe enough to cause retardation of growth, edema, or ulceration.

Soil pollution is not prevalent throughout the Island. Where it exists it can be prevented through the use of a simple type of latrine well within the resources of the natives. The Navy has sufficient personnel, drugs, and other facilities available for treating parasitic infections and for carrying out thoroughgoing measures of control with practically no outlay beyond the routine expenditures now being incurred.

SURVEY OF SAO PAULO, BRAZIL

An infection survey of the State of Sao Paulo was made between December 1, 1917, and February 28, 1918. Eleven towns and two coffee plantations in representative parts of the State were selected as centers for carrying out the survey. The number of persons examined was 8,751, and 58.9 per cent were found to be infected. Four of every five persons harbored either hookworm or another type of intestinal parasite.

Relationship of Soil to Percentage of Infection. The character of soil in different regions was found to have an important bearing on the percentage of hookworm infection: the less sandy and absorbent the soil, the lower was the rate of infection recorded. In three towns built on compact red clay, the average percentage of infection was only 43.7, as compared with an average of 63.8 per cent for four towns built on slightly sandy soil, and of 75.0 per cent for four towns built on slightly sandy soil, and of 75.0 per cent for two coffee plantations where the soil was the most sandy and most porous of all the areas surveyed.



Fig. 30.—Hookworm infection map, State of Sao Paulo, Brazil

Effect of Use of Latrines on Infection Rates. Classification of the persons examined with respect to the latrine accommodations at their homes showed that the highest rate of hookworm infection was among 6,631 persons who stated that they had no latrine accommo-

dation whatsoever. In this group the rate was 62 per cent. Compared with this, the average rate for those who had latrine accommodations, whether good or bad, was 48 per cent. The rate among those who used septic tanks or had sewer connections was only 37 per cent, the lowest recorded for any of the groups.

Inauguration of Comprehensive Program for Control. At the close of the survey, or on March 9, 1918, intensive operations for the control of the disease were begun at Guarulhos, a rural area located near the capital city of Sao Paulo. Meanwhile the Director of the Public Health Service offered, on behalf of the State, to organize and maintain five posts for the control of the disease if the Board would maintain two. A second post was thereupon established at Atibaia on July 9, and the State opened one of its five posts in June, two in August, and two in September. At the close of 1918 seven posts, each with its own staff of physicians, dispensers, and sanitary inspectors, were attacking the disease simultaneously from strategic centers throughout the State. The five posts established by the State were maintained during 1918 at a cost of approximately \$60,000.

INFECTION SURVEY BASED ON WORM COUNTS

A new type of infection survey, making worm counts its central feature, was developed by the Board's Uncinariasis Commission to the Orient. This was employed in carrying out the survey of Java in 1916 and has since come into extensive use in Brazil. The customary microscopic examination of fecal specimens is dispensed with, and the counting of worms expelled as the result of treatment by representative groups of persons is substituted.

Methods of Conducting Worm-Count Survey. The patients to be treated are carefully selected from the different localities to be included in the survey. Effort is made at all times to secure groups whose state of health closely approximates the average for their communities. Not less than twenty-five nor more than thirty persons are usually chosen for each locality, adults comprising two-thirds of the group. Different activities and occupations find proportionate representation, and the number of males and females—of boys and girls as well as of men and women—is equalized wherever possible. The subjects to be examined are treated with a vermifuge, and all stools which they pass for three days are retained, washed, and searched for worms. The worms passed by each person are then counted and identified as to species. Treatment is usually repeated at ten-day intervals until three treatments in all have been taken.

Advantages of New Type of Survey. The principal advantage of this method of conducting a survey lies in the fact that it yields

more accurate information as to the severity of the infection than does the ordinary microscopic search for eggs in the feces. It is especially valuable for determining not only the extent but the severity of hookworm infection in different localities, and the effects of occupation, age, etc., upon the number of worms harbored. By thus indicating more accurately the relative severity of the infection in different localities and among different groups, it enables control measures to be undertaken with greater assurance that the disease is being attacked first in those areas where it assumes its most serious aspect.

VI

HOOKWORM CONTROL OPERATIONS

Nothing could be simpler in theory than the few measures necessary for the control of hookworm infection. The cycle of the worm from the moment the egg is deposited on the ground until it has reached the small intestine of its human host and developed to its adult stage, is well understood, as are also the details of its life-story and environment; and there are at least two drugs which are most potent in freeing the human system of the parasites. It should therefore be relatively simple to locate and to cure those who have the disease, to prevent others from contracting it, and thus to bring about, within limited areas at least, its complete eradication.

Complete Control Never Accomplished. Although the problem of complete eradication is simple when stated on paper, it is not so in practice. The Board has been engaged in work against hookworm disease since 1910, similar work was undertaken in Porto Rico in 1904, and the attack on the disease in the mines of Belgium, Holland, and Germany began as early as 1902, yet it is impossible to point to any one mine or area from which the infection has been completely eradicated. In the mines of Germany it was reduced from 16.8 per cent in 1903 to .18 per cent in 1912; in those of the Netherlands, from 25 per cent in 1903 to .32 per cent in 1913; and in those of the Liege district of Belgium, from 22.8 per cent in 1902 to 1.2 per cent in 1913. These are the nearest recorded approaches to complete control.

Difficulty of Completely Eradicating the Infection. Many obstacles stand in the way of complete eradication, even in isolated areas having no immigration and with natural conditions that either limit or preclude intercourse with the outside world. It is seldom possible to examine every individual in an area or to treat until cured all who are found infected; when latrines of a proper type are installed in sufficient numbers to prevent soil pollution, it is still necessary to accustom the people to the use of them—and this is a task that usually requires a long period of education and enlightenment; and even when both the foregoing conditions are fulfilled, there still remains for a time the danger of re-infection from hookworm larvae already in the soil.

RE-INFECTION IN TREATED AREAS

The failure to achieve *complete* control of the infection in any area is probably due in the main to three reasons: first, that in most of the areas of operation effective excrement disposal has not preceded

the curative work by more than ten months; secondly, that there has been an error of greater or less degree in microscopic diagnosis; and, thirdly, that there is at present a lack of data on certain points concerning which definite knowledge is essential for control. In six countries during the period under review, a large number of persons who had previously been treated and presumably cured were re-examined in order to ascertain whether infection was recurring in the areas in which they lived, and if so to what extent.

Low Rate of Re-Infection on Costa Rican Plantations. The lowest re-infection percentage recorded was in Costa Rica, where on Aquiares estate only 4.0 per cent infection was found on re-examination of 223 laborers who had been cured eighteen months earlier. On another estate in this country—Rodeo—a rate of 14.4 per cent was found among 191 persons who had been cured from five to eighteen months earlier. On neither estate was every home provided with a latrine: Aquiares had but half and Rodeo but one fourth its homes provided with this convenience at the close of the curative campaign. The re-infection rates for these estates are in striking contrast to those reported for areas in other countries where similar re-examinations were made.

Re-Infection Rates among Treated Patients in St. Vincent. In St. Vincent three dispensers spent their entire time during the period from May 13 to June 18, 1918, in collecting specimens from persons who had been cured in Calliaqua, Belair, and Sion Hill, the three first areas of this colony in which systematic measures for the control of hookworm infection were completed. The original work in the Calliaqua area ended on September 30, 1915, in Belair on December 31, 1915, and in Sion Hill on April 5, 1916; in each area, therefore, more than two years elapsed between treatment and re-examination. In all, 1,525 of the 2,257 persons treated and reported cured in the original campaigns were re-examined and 67.6 per cent of them were found to be infected. The re-infection rates were 46.9 per cent in the Belair district, 64.8 per cent in Calliaqua, and 68.2 per cent in Sion Hill, being lowest in Belair, where the greatest amount of sanitary work was done.

Re-Examination of Treated Patients in Seychelles, Nicaragua, and Trinidad. In the Seychelles Islands, among 267 persons known to have been cured six months or more previous to re-examination, an infection rate of approximately 30 per cent is reported. Here the homes are now provided with latrines and there is but little evidence of soil pollution. The director for Nicaragua states that at the end of a year there was a re-infection rate of 65 per cent in the town of Nandasmo, where every home had been provided with an approved latrine during the progress of the curative campaign; and the director for Trinidad reports re-infection rates varying from 18 to 84 per cent for certain districts of that colony in which the people were treated more than a year ago. The extent

of re-infection in Trinidad was found to vary with the sanitary condition of the districts. Areas with very poor sanitation invariably had more than 60 per cent re-infection, and those in good sanitary condition had relatively high rates of re-infection if poorly sanitized districts surrounded them. (See Fig. 33, page 157.)

High Re-Infection Rates on Estates in Ceylon. It is from Ceylon, however, that the highest rates of re-infection have been reported. On the thirty-three estates of the Matale area whose laboring force was partially re-examined during 1918, after the lapse of at least a year, the average percentage of re-infection was 88 among a total of approximately 3,000 persons examined. The rate ranged from as low as 45 on one estate to as high as 100 on ten. Nineteen of the estates had re-infection percentages between 91 and 100; six between 81 and 90; three between 71 and 80; and only five less than 70. (See Fig. 31.)

In the Bogawantalawa and Dickoya areas—the two other estate areas completed at practically the same time as Matale—systematic re-examinations have not yet been made on a large number of estates, but the information received from Bogawantalawa shows that on the three estates for which reports have been received, the re-infection rates at the end of twelve months or more were 70, 88, and 100 per cent.

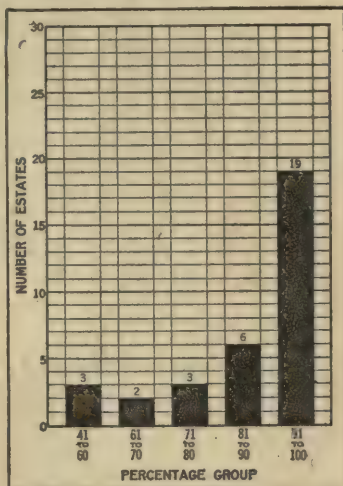


Fig. 31.—Re-infection rates at end of one year or more. Thirty-three treated estates of Matale area, Ceylon. Persons examined, approximately 3,000

Re-Examinations on Ceylon Estates Completed during 1918.

A limited number of re-examinations were made in the estate-areas of Ceylon in which operations were terminated during 1918. Three months after completing work on the estates in the Upper Maskeliya area, specimens were re-examined from 348 laborers who had been reported cured, and 13 per cent were found to be infected. On nine estates in the Elpitiya area a proportion of the inhabitants were re-examined from six to eight months after the close of the campaign. Here the infection percentages ranged from 6 to 47, the average being 31. In the Koslanda-Haputale area, among seven estates a number of whose residents were re-examined at the end of four months, the rates ran from 2 to 13, the average being only 7. It should be

pointed out, however, that in the case of all three of the estate areas last mentioned the re-examinations were made too soon after the

completion of the original campaign. It is to be expected that other re-examinations which will follow at the end of twelve months or more will establish re-infection percentages more closely approaching those recorded for Matale and Bogawantalawa. (See Fig. 32.)

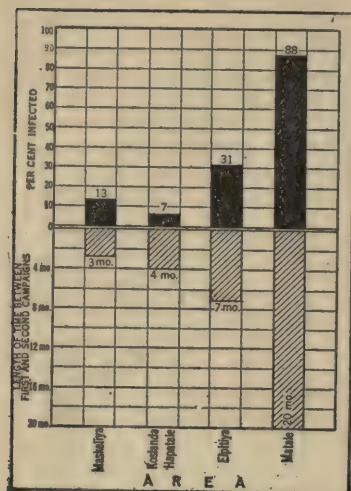


Fig. 32.—Re-infection rates in Ceylon. Relationship between length of time elapsing between treatment and re-examination, and rates of infection recorded

Reduction of Mass Infection First Essential to Control.

These high rates of re-infection should not be accepted as indicating that no considerable progress has been made toward bringing the disease under control. It should be remembered that the problem of hookworm control is primarily one of reducing mass infection. The practical phase of the task is concerned with the removal of the largest possible number of worms from the largest possible number of infected persons. Upon this basis the best criterion for

judging the effectiveness of a curative campaign in any area is not the percentage of infected persons who are cured or who remain cured, but the proportion, expelled and destroyed, of the total worms harbored by the population.

Factors Determining Percentages of Re-Infection. Even though in certain of the areas mentioned, from 50 to 100 per cent of the persons formerly cured of the disease have since become re-infected, there can be little doubt that as a result of treatment the average number of worms harbored by each infected person has been very materially reduced. Conditions extremely favorable for the prevalence and persistence of the infection exist practically throughout all countries in which the work has been conducted; there is at present lack of definite knowledge as to how long larvae remain infective in the soil; the latrine accommodations provided in many areas have been defective or inadequate, the habits of the people grossly insanitary, and in addition war conditions have interfered seriously with due and effective sanitary supervision and reasonable regimentation. Under these circumstances re-infection was bound to occur in

greater or less degree, but it will unquestionably diminish as effective sanitation is introduced and the curative measures are extended.

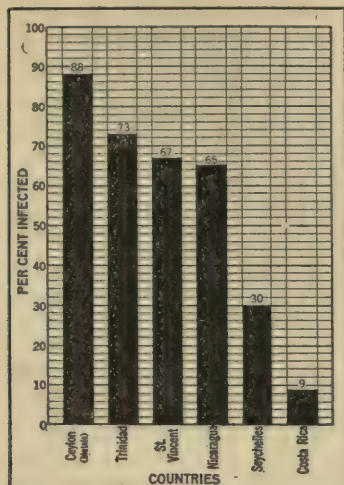


Fig. 33.—Re-infection rates among persons previously treated for hookworm disease, by countries. Interval of twelve or more months between treatment and re-examination

NEED OF SCIENTIFIC KNOWLEDGE ON FACTS ESSENTIAL FOR CONTROL

The fact that after a series of efforts at control in different parts of the globe extending over a period of more than fifteen years it is still impossible to point to any single area from which the disease has been completely eradicated, suggests that perhaps the work is being carried out with a lack of scientific information on certain points concerning which definite knowledge is indispensable if complete control is to be achieved. It is hoped that a series of studies may soon be made which will supply definite experimental proof on the phases of hookworm control which still require further investigation.

Viability of Hookworm Larvae in Soil and Feces. One of the most important factors in need of further study is that relating to the viability of hookworm larvae in soil and feces. In the past it has been commonly supposed that after a period of from six to ten months the soil would become sterile and the disease would gradually die out, but the evidence now at hand seems to indicate that soil once heavily infected—particularly in tropical countries where the

temperature seldom or never drops to the freezing point—must remain infected for a considerable time even after sanitary conditions have been improved. Thus, Kofoed has recently reported that in the soil of California the larvae remained alive for twelve months, and it is probable that in more tropical climates they persist for even longer periods.

a. Life of larvae in garden soil of China. There was opportunity for limited investigation of this question in China during 1918. In this country, much of the soil is under cultivation the year round, assisted by intensive fertilization with human excreta. In the middle of August a plot of land in which no larvae could be demonstrated was fenced off. This plot was then divided into three sections. In (A) the ground was dug up in the manner that is followed in planting a Chinese vegetable garden, and feces that were known to contain hookworm eggs and larvae were mixed with the soil. In (B) infected feces were merely sprinkled over the top. In (C) the ground was left undisturbed and uncontaminated. The plot of ground selected for the experiment was 1000 ft. above sea level and during the period of five months that had elapsed up to December 31, 1918, had been subjected to temperatures, varying from 38° centigrade to 4° centigrade. The soil in the meantime had been directly exposed to the summer sun and to the winter ice and snow.

For the entire five months' period plot (C) gave negative results. On the other hand, until the cold weather set in in December, larvae could always be found in (A) and (B) on the first slide examined. Afterwards it was necessary to pour water on the culture to draw the larvae out, and the last time the test was made three slides had to be prepared before a larva was found. The larvae were always actively motile in (A) and (B) and in December were still present in enormous numbers.

In other experiments conducted during the month of September and again at the end of December, fifteen fields were indiscriminately chosen and samples of soil obtained and cultivated. All were positive for hookworm larvae.

b. Investigation of larvae viability in storage pits. It is customary for Chinese farmers to store excreta in storage pits after purchasing it for use as fertilizer. An investigation was made during 1918 of the probable duration of life of hookworm ova and larvae in these pits. For economical reasons none of the farms visited had feces that had been in storage for more than two and one-half months, despite the fact that the farmers claim that the older the excreta the more valuable it is for fertilizing purposes. On one occasion thirteen pits were visited and on another twelve, and samples of feces were obtained from all. The age of the feces from which the samples were taken ranged from three to seventy-two days. All specimens contained both hookworm and ascaris ova, but larvae were not numerous except on cultivation.

c. Penetration of larvae through sand. Dr. Dersheimer investigated this question in connection with his work at the Onderneeming Industrial School in British Guiana. In spite of the fact that pail latrines had been in use in this institution for some time, an unusually high percentage (95.8) of the 142 boys living there were found infected. On investigation it was discovered that the contents of the latrines were buried around lime trees to fertilize them, and that a large proportion of the boys who worked round these trees when the ground was wet subsequently developed ground-itch. A pound or more of sand taken from the surface near the trees was examined microscopically and numerous larvae were discovered. All had worked through two feet or more of sand to gain the surface.

Transmission of Infection by Flies and Dust. Some data from Arkansas and Texas brought together by means of the laboratory car *Melchnikoff*, during the treatment of infected soldiers in the Southern States, suggest that there is a possibility of the infection being transmitted by dust. This subject is worthy of further study. The rôle played by insects, particularly flies, in transmitting the infection, also remains to be thoroughly investigated. The latter problem was studied to a limited extent in China during 1918. On two occasions several hundred flies of the "blue-bottle" species were taken from several native latrines. Those from each latrine were placed in separate bottles and thoroughly washed. The water was then centrifuged and microscopic examinations made. All the specimens gathered from the seven latrines visited on the first occasion showed ascaris and one showed hookworm ova, while those from all five latrines visited on the second occasion again showed ascaris and one showed hookworm ova. The water in which the flies were washed was then cultured by the charcoal method, but no additional hookworm larvae were demonstrated. No explanation can be offered as to why the eggs of one parasite should be found more frequently than those of another, as the percentage of the population infected with both parasites is about the same. The end of the fly season prevented further investigation being made of this interesting subject.

MODIFIED WORKING METHODS TO REDUCE MASS INFECTION

It has long been evident that if treatment is to be extended to the hundreds of millions of East Indians, Egyptians, and Chinese, to say nothing of the dense masses of humanity inhabiting other tropical and subtropical lands, a means must be found of lowering the cost of the work without seriously impairing its efficiency. The great bulk of the people in these lands are agriculturists, and practically one hundred per cent of the adolescents and adults among them are in-

fected. Two means exist of making treatment more readily available for them: (1) preliminary microscopic examination may be omitted in regions of heavy infection, and the time and personnel now engaged in this phase of activity may be utilized for actual curative or preventive work; and (2) since it seems neither necessary nor feasible to attempt the immediate removal of the very last hookworm which these persons harbor, a quickly efficient and reliable method of treatment may be developed which can be administered as a routine, with the expectation that effective sanitation and post-campaign treatment will eliminate whatever light infection remains.

Impracticability of Insisting upon Absolute Cure. To strive for the cure of each infected person often involves a long series of treatments and re-examinations, and besides is in certain other respects an impracticable standard. In present practice by this plan it is not usual for all the worms to be expelled. Instead, they are reduced to a minimum. When microscopic examination aided by the centrifuge is the method of diagnosis employed, there is a material error in first examinations as well as in re-examinations after treatment has been taken,—an error which may be conservatively estimated as exceeding 15 per cent. Thus there is considerable unreliability in the very standard upon which cure is based. Then, too, infected cases not detected by the present method of diagnosis not only are given no opportunity to receive treatment for hookworm or for other parasites, but these, as well as the cases inaccurately pronounced cured after treatment, are given the impression they are free and as a result they continue to spread the disease. There are also large numbers of persons who cannot be cured because of refusal or for medical or other reasons. This group commonly represents about 20 per cent of those infected. While striving for cures in four-fifths of the infected population, this group escapes and continues to seed its environment.

Mass Treatment Without Preliminary Diagnosis by Microscope. After all, it is not the few worms left after treatment, but the average of 150 or more worms harbored by the great mass of infected and untreated humanity in tropical and subtropical lands, that is the important factor in hookworm control. Communities in which the adults have an average of fifty or less worms obviously do not require treatment so urgently as more heavily infected localities. Where there is a high rate of infection and the average number of worms per person exceeds fifty, it would seem that the people might be treated *en masse* without preliminary microscopic examination, every person in the group except the very young and very old receiving treatment. Even though in a few instances more than 10 per cent of the worms remained after routine treatment, this would be offset by the error in microscopic diagnosis under the present plan of work. Therefore, though the modified plan when considered



Fig. 34.—Staff for the relief and control of hookworm disease in State of Rio de Janeiro, Brazil.
(Unit No. 1)



Fig. 35.—Hookworm cavalry in State of Rio de Janeiro, Brazil. Director, sanitary inspector, and nurses ready to attack strongholds of the disease

theoretically may seem to lack a certain degree of thoroughness, in actual operations by this plan it would seem that but little thoroughness should be lost.

Experimental Plan of Control for Ceylon Estates. Ceylon was the first country in which the modified intensive plan of control was attempted. More than 99 per cent of the Tamil laboring population of this country is infected with hookworm disease. Preliminary fecal examination was therefore omitted for all except ten or twenty per cent of the laborers on each estate. If the specimens obtained showed over 80 per cent infection, the whole labor force, except persons less than a year old, those physically unfit for treatment, and pregnant women beyond the third month, were given one or two medium doses of chenopodium with an interval of one week between.¹ All were examined clinically to see if they were fit to take treatment and also to impress them. Ten days after the first or second treatment, fecal specimens were obtained from all those who had been treated, and as a rule it was found that about 70 per cent of those who had had two treatments had been cured.

Modification of Intensive Plan Tentatively Adopted for Brazil. In Brazil, too, the enormous extent, high rate of infection, and sparseness of the population in many regions, have led to a similar effort to accelerate the rate of treatment by conservative modification of the plan originally followed. In certain of the posts in this country it is now customary to take a census of every individual and to examine all once, and once only, microscopically. Every individual found infected with hookworm disease is treated twice with oil of chenopodium, with an interval of ten days between treatments. Individuals with hemoglobin below 50 per cent are treated three times without additional microscopic examination, unless malaria is a controlling factor in the anemia. In addition, all persons suffering from any form of intestinal helminthiasis whatever are treated once, as well as *all* the members of any family which contains even one infected individual. It is believed that this plan of work will succeed in reaching all infected individuals and succeed in eliminating from them at least 95 per cent of the intestinal parasites they harbor. If at the same time the construction of latrines at all the homes is secured, the community will be permanently protected and the remaining worms will probably disappear. Summed up in few words the system means: a latrine at every house, education sufficient to assure its proper use, and every infected individual treated at least twice.

Study of Relative Efficiency of Regular and Modified Intensive Plans. The Board is not yet prepared to commit itself definitely to the new plan of work. Before doing this it will have to test experi-

¹ For discussion of the efficiency of standard chenopodium treatment, see pages 140 to 143.

ence under a wide variety of conditions and in a number of different fields. An initial step in this direction is under way in the State of Sao Paulo. In one of the two posts which the Board is maintaining in this State, the standard has been set of treating every infected individual to a cure. In the other, every infected individual is being given one microscopic examination and two treatments of chenopodium. The conditions of race, infection, and laboratory efficiency are practically the same for both posts. All details of the work are to be closely observed. Worm counts will be used as a means of checking the findings and of verifying the conclusions reached.

POST-CAMPAIGN MEASURES ON CEYLON ESTATES

Arrangements by which post-campaign measures will be conducted on all estates on which the regular work of treatment has been completed, were made with the Government and planters of Ceylon during 1917. It is planned to have these measures continue for a period of eighteen months following the close of the initial demonstration in the different estate areas. They will be under the supervision of Government medical officers, assisted by microscopist-dispensers trained in regular campaign work. At the end of the eighteen months' period of organized post-campaign measures, the estate dispensers will be expected to handle the situation, which will consist mainly of the treatment of small groups of new laborers coming to the estates from time to time.

Extent of Post-Campaign Work to End of 1918. In January, 1918, post-campaign measures were begun on the estates in the Matale area, where the original treatment campaign had been completed during 1917. More than 3,000 laborers received post-campaign treatment up to the end of the year. It was hoped that thoroughgoing post-campaign measures might also be carried out in the Bogawantalawa and Dickoya areas, as the demonstration campaigns there had also been concluded during 1917, but in these areas the work had scarcely begun when it had to be interrupted and later suspended because of the influenza epidemic.

Methods Followed in Post-Campaign Work During 1918. In carrying out the post-campaign work in Ceylon, the plan followed during 1918 was to take a complete census of each estate and to distribute tins to at least fifty coolies taken indiscriminately from men, women, and children who had been treated in the original demonstration campaign. This served to indicate roughly what percentage of re-infection had occurred. The medical officer clinically examined every person and prescribed for those who were to be treated. Two treatments, separated by an interval of ten days, were administered, and the staff vacated the estate.

Proposed Modification of Post-Campaign Methods for 1919.

During 1919 it is proposed to modify the plan in the case of those estates on which the post-campaign medical officer, after careful survey of the latrines and of a zone within a radius of seventy-five yards around each of the lines or groups of lines, finds that the latrines are in general use and are being properly kept, and that the zones around the lines are free, and are being kept free, from visible soil pollution. On such estates a third treatment is to be given to all found to be still positive on microscopic examination after the second treatment. This will complete the work on such estates if arrangements are made for the treatment of all new coolies immediately upon their arrival. On all other estates, additional treatments, after the first series, are to be deferred until eighteen months after the close of the original demonstration campaign, by which time specific soil pollution should be controlled.

VII

SOIL SANITATION AS A MEANS OF CONTROL

The crux of the hookworm problem lies largely in the contamination of the hands and feet of the people with fecal matter. This occurs mostly under rural conditions. The most important undertaking in all efforts to stamp out the disease is therefore to prevent the deposit of ova-impregnated feces on the surface of the ground. This may be accomplished by securing the provision and use of properly built and adequate latrines to serve as receptacles for the contaminated matter. To assure the installation, maintenance, and use of sufficient and satisfactory latrines is, however, a formidable undertaking. It involves the task of inducing hundreds of millions of people in the infected regions to abandon habits ingrained by centuries of usage and often dictated by the religions to which they adhere, and to accustom themselves to new and in some respects difficult habits, the necessity for which they must in some manner be brought to appreciate.

Defining the Problem by Sanitary Surveys. The original sanitary problem of each area of operations is defined by a house-to-house canvass during which the facilities that exist at each house for safely disposing of human excrement are carefully noted. This initial sanitary inspection is generally carried out in advance of the curative work. During the past year, statistics have been gathered as to the latrine conditions at 95,706 homes in 236 rural or semi-rural areas in various tropical and subtropical lands. Classing as satisfactory any type of latrine that effectually prevents soil pollution and is fly-proof, only 9,381, or 9.8 per cent, of the homes in these areas were reported to have satisfactory accommodations, while 50,749, or 53.0 per cent, had no accommodations whatever when the curative work was undertaken. The situation on first inspection in a number of widely-separated but typical rural localities is instanced below to show the need of thoroughgoing sanitary reform if soil contamination is to be prevented and hookworm disease eventually controlled. The conditions in the areas mentioned are not unusual, but repeat themselves with greater or less fidelity in the different countries in which control measures are being undertaken.

a. Lack of latrines on Sao Paulo plantations. The survey of Sao Paulo completed during 1918 showed that on the coffee plantations of this State the owners' and managers' houses are generally the only ones provided with latrines. As a result the soil around the coffee plants is infected with larvae and the workers constantly re-infect themselves. The soil is porous and is kept moist by the shade of the

coffee trees, and for the greater part of the year the temperature is fairly high. Conditions are therefore ideal for the eggs to hatch and for the larvae to develop.

b. Sanitary situation in selected areas of Southern States. In the entire rural area of Hart County, Georgia, not a single sanitary latrine was found at the time of first inspection. In South Carolina, among 5,703 homes in three counties, 3,334, or 58.5 per cent, were found to be provided with insanitary latrines of the open-back, open-seat variety. An additional 1,518, or 26.6 per cent, were without facilities of any sort for disposing of their excrement. In Texas, only 13.7 per cent of 4,758 homes located in eight counties, had satisfactory conveniences when the work began. Two hundred eighty-five, or 6.0 per cent, had no conveniences at all.

c. Facilities for fecal disposal in Queensland and Trinidad. In the infected regions of Queensland, Australia, the pail system, with burial of the contents, was in general use on first inspection, but the latrines were mostly of the open-back, open-seat variety, inadequate for preventing soil contamination. In the Caroni, Maracas, and Laventille areas of Trinidad, the sanitary conditions were reported to be very bad. In the Caroni area there were a number of heavily-infected villages in which not a single latrine could be found.

Methods Followed in Securing Sanitary Improvement.

Practically all the states and countries which are carrying on measures against hookworm disease have adopted one or more types of latrines, and have made provision for a more or less complete system of inspection to assure the erection and use of these latrines in sufficient numbers to guard against soil pollution. The staff engaged in the curative work endeavors through its educational activities to bring all the people to appreciate the necessity of providing themselves with some form of latrine that will permit the safe disposal of excrement, and in each instance recommends the type or types of latrines adopted by the Board of Health of the state or country in which the work is being conducted.

Types of Latrines Recommended. In general, any means of disposal is acceptable if it provides against dissemination of infected material by flies, against pollution of the ground in places accessible to bare feet, and against the contamination of drinking water. There are six main methods that do this: (1) the fly-proof pail latrine, where the ultimate disposal of the night soil is under careful supervision and is satisfactory; (2) the pit latrine, when fly-proof and so located as not to pollute the drinking-water supply; (3) septic tanks properly constructed; (4) sewerage; (5) treatment of the feces with an effective chemical; and (6) incineration plants. There are practical considerations touching upon the relative merits of each of these methods, and in many countries, where the choice lies between two or more forms of disposal, it is only the cheapest that

the people in large numbers can be induced to use. This goes far toward explaining the present popularity of the pit privy, which, though not ideal, has come into use on a large scale mainly because it is inexpensive and requires but little effort to maintain.

INVESTIGATION OF SEWAGE DISPOSAL IN SOUTHERN STATES

The diversity of opinion among public health officials as to the best method of disposing of human excrement in rural communities with limited means, led the National Conference of State and Provincial Health Officers, at its meeting in Washington, D. C., on June 3 and 4, 1918, to urge the Surgeon General of the United States Public Health Service to appoint a special commission to study the subject and make recommendations. Prior to this, in January, 1916, the Board, recognizing that definite information on the subject would be of considerable assistance to local health authorities, had made provision for carrying out, under the direction of the Rockefeller Institute for Medical Research, a study of the types of latrines commonly used for disposing of feces in unsewered localities. It was hoped that from the facts brought to light it would be possible to evolve a method, or various methods, of disposal that would be safe and practicable under prevailing conditions.

Method of Approaching the Problem. The work was placed in charge of Dr. I. J. Kligler, of the Rockefeller Institute, whose studies, conducted over a period of two years, have sought to test experience under a variety of conditions. The problem was approached from both the field and experimental points of view. In the laboratory, repeated tests were made to determine the viability of typhoid and dysentery bacilli in soil and in excrement under different conditions, their ability to penetrate columns of soil of different degrees of porosity, their viability in septic fluids and effluents, and the nature of the antagonistic factors in soil and in septic material which influence their viability. In the field work, particular attention was paid to the extent of pollution of the soil surrounding privies and the relationship that privies bear to the pollution of wells. The pit and the septic tank were the types of privies mainly studied, though other varieties, including the pail privy and the chemical toilet, came in for a limited share of attention.

Method of Conducting Studies in the Field. The studies of the septic tank centered on field investigations of thirty Kentucky sanitary privies, which had been in use for periods ranging from four months to three years. The L. R. S. type was investigated only in the laboratory. Practically all the Kentucky privies examined were of the rural type.

The pit privy was tested in five widely separated communities in the State of South Carolina. These communities presented practically all soil formations common to that State. The soil in the first was hard, red clay; in the second and third, sand-clay; in the fourth, sand on a sandstone bed, with a water-table eight to ten feet below the surface; in the fifth, sand and sand-clay. The privies, more than fifty in number, had been used from one to three years, and were studied during both the dry and rainy seasons.

In investigating the pit privy, specimens of soil were taken at different depths and at different distances from the pit, to learn the source and direction of any seepage that might be occurring. The effluent from septic tanks was also collected and examined, the soil samples being taken in the same manner as for pit privies.

Results of the Investigations. The main findings of the survey, subject to confirmation by more extended investigations, are: (1) that typhoid and dysentery bacilli succumb rapidly upon being exposed to unnatural environment, consisting either of the effluent from septic tanks, of solid feces, or of soil; (2) that the spread of pollution from a focal point is limited in scope; and (3) that pollution of the wells, when it occurs, is usually derived from the surface. The experiments indicated that the vertical distance between the source of pollution and the ground water level, as well as the character of the soil, are the important factors for consideration in choosing the method to be employed in disposing of sewage. The horizontal distance between the polluted area and the well was found to be of relatively slight importance except where there are underground channels or cracks in the soil.

In moderately compact clay, sand clay, or sandy soil, free from cracks, the possibility of subsoil pollution of the ground water from pits and septic tanks seems to be negligible if a vertical distance of at least ten feet is allowed between the fecal deposits and the ground water level. The pit privy is not considered safe in limestone regions or in soil where the ground water level is near the surface. For such localities the Kentucky sanitary privy or a privy of similar design, with sufficient storage capacity to allow time for the destruction of pathogenic bacilli, and with the drain placed from three to five feet above the ground water level, is thought to be best.

Need of Additional Inquiry to Establish Preliminary Deductions. It is recognized that these experiments and tests are only preliminary in character and that they have not yet been carried far enough for definite conclusions to be drawn from them. Conditions growing out of the war made it necessary to await favorable opportunity for a more extended study of the problem. The further study to be undertaken should include, among other subjects, a thorough investigation of the viability of the eggs of intestinal parasites.

SOIL SANITATION IN ADVANCE OF TREATMENT

There is a growing tendency for governments to arrange for the proper disposal of excrement in advance of the examination and treatment of the people. Ceylon led the way in this movement. Government regulations enacted in that colony during 1916 required all estates to erect adequate latrines for their laborers before the expiration of one year. As a result, the new estate areas undertaken during 1917 and 1918 were provided with latrine accommodations before the curative work was inaugurated. This situation will hold true with respect to all other estate areas that are selected for work in this colony. A similar movement is reported from Brazil, Queensland, the Seychelles Islands, China, Siam, Nicaragua, Salvador, and British Guiana, and the agreements entered into with Jamaica and Barbados, where measures against hookworm disease are shortly to be inaugurated, specify that effective sanitation shall precede examination and treatment by at least six months. The Australian authorities also are reported to be favorably disposed toward making the installation and use of latrines a prerequisite to the opening of work for hookworm control on the estates of Papua.

Advance Sanitation in Brazil and Seychelles Islands. In Brazil, the State of Parana has already undertaken active sanitary operations in anticipation of the opening of curative work, and reports a beginning through the installation of latrines in the town of Jaguarihyva. Other states of that country are expected to adopt a similar program. Similarly, in China, no new miners have been examined at the Pinghsiang Colliery since August, 1918, unless the areas they worked in were provided with adequate latrines. In the Seychelles Islands, careful sanitary inspection of about half the area in which curative work remains to be carried out was made during 1918. This revealed that an excellent start toward eradicating the disease had been made through the installation of latrine accommodations for all the residents. Though soil pollution has not been entirely stopped, it has been greatly reduced, and there is every indication that in this area a situation has been brought about that will permit the fullest realization being made of the benefits of the curative work.

LEGAL ASSISTANCE IN LATRINE PROVISION

During 1918 the States of Sao Paulo, Minas Geraes, Parana, and Bahia, in Brazil, adopted and put into execution rural sanitary codes which make obligatory the provision of latrine accommodations at every home within their jurisdictions. The State of Rio de Janeiro, of the same country, had already adopted such a law in 1917.



Fig. 36.—Ceylon tea estate, showing laborers' quarters in good condition. Latrines appear at right of photograph



Fig. 37.—Pit latrine for use of forty laborers.
Plantation, Dutch Guiana

Shortly after the close of 1918, the General Assembly of North Carolina adopted a similar state-wide law, and numerous towns and counties in other Southern States have adopted ordinances requiring latrines at all homes within their incorporated limits.

Latrine Ordinances Enacted in Queensland. The health act of Queensland, Australia, clothes the local authorities of each shire or township with full authority for securing effective excrement disposal. During 1918 an ordinance for enforcing the improvement of all latrines was adopted by Cooktown, Port-Douglass-Mossman, Cairns, and Cairns Shire,—all embraced within the territory in which measures against hookworm disease were being carried out. These ordinances gave the owners a limited time for making repairs, and provided that after the expiration of that period the alterations would be made by the local authorities at the expense of the owners.

ESTATE SANITATION IN CEYLON

Before the opening of work against hookworm disease in Ceylon, few estates had latrine accommodations for their labor, and the houses in the villages were seldom equipped with sanitary conveniences. Now practically all estates have adequate latrines. This means that since the work was undertaken in January, 1916, approximately 50,000 latrine compartments, sufficient to provide accommodations to 700,000 persons, have been installed. Now the great problem is to bring about the use of the latrines that have been built.

Difficulty of Enforcing Use of Latrines on Estates. On all the estates the latrines are used to greater or less extent, but there is still considerable evidence that the soil is being polluted. This commonly occurs about laborers' quarters and along bridle paths. The efforts to improve sanitary conditions being made by the estate superintendents will require time to yield results, as the laborers are indifferent about using latrines. Nevertheless it is encouraging to report that the number who do use them is steadily increasing.

Adequate System of Latrine Inspection Needed for Estate Areas. The definitive recognition of soil pollution as an offense punishable by law, and the establishment of a regular system of inspection, may be required to guarantee that the estate latrines are properly used. The Senior Sanitary Officer now has a competent body of trained sanitary inspectors, but their activities are confined in the main to sanitary board areas and to special districts where conditions are very unsatisfactory. The extension of this work to reach all of Ceylon is to be the next step.

VILLAGE SANITATION IN CEYLON

Much of the infection and re-infection on estate areas is probably acquired in the villages and bazaars included within the boundaries of these areas or situated closely adjacent to them. Until recently no latrines had been erected in these localities, but the Government, recognizing the futility of treating and curing the estate laborers only to have them re-acquire the infection on their visits to the villages or to the largely-patronized bazaars, has lately issued orders to the village headmen and other authorities to have latrines constructed for village and bazaar communities. In the Matale area the sanitary department has had from two to four qualified inspectors at work for more than two years, extending the latrine and privy system throughout the villages. Nearly 2,500 village latrines were erected in this area during 1917, and, although no figures for final results are yet available, the work went steadily forward during 1918. In the village communities in or near other estate areas in which treatment campaigns were conducted up to December 31, 1918, many additional latrines have been installed, but the absence of an adequate system of inspection has sometimes resulted in these latrines being of an inferior type.

Installation of Latrines in Southern and Western Provinces.

It is estimated that in villages located in other parts of the colony, between 40,000 and 50,000 latrines have been built since the beginning of 1916, nearly all of them by the villagers themselves. Of these, 480 were installed in 1916 and 25,215 in 1917. Exact figures for 1918 are not yet available. In the rural parts of Weligama-Korale, in the Southern province, with a population of about 200,000, privies to the number of 21,419 have been erected during the past eighteen months or two years, more than 19,000 of them during the past seven months. These are sufficient to provide accommodations to at least 100,000 persons.¹ The villagers built all of these latrines without prosecution and are using them without reluctance. By special tax and with a Government grant and loan, 40,000 rupees will be available for the erection of latrines in two towns of this province—Matara and Weligama—during the coming year. Extensive sanitary improvements have also been made at Minuwagonda and surrounding villages in Western Province. Here the whole township, with a population of about 9,000, and the villages within a two-mile radius, having a combined population of 3,000 or 4,000, have been provided with sufficient latrines. Sanitary surveillance is to be maintained by qualified inspectors, who will also carry on educational work, including lantern talks, on health subjects.

Latrine Building as Means of Interesting Villagers in Hookworm Relief Measures. Paradoxically, the installation and use

¹ These figures take no account of local board or sanitary board activities.

of latrines affords the best entering wedge for work among the Singhalese villagers who form the permanent population of Ceylon. Lantern talks by native dispensers gain the sympathy and interest of the villagers, lead to extensive privy building, and later to a request for the establishment of dispensaries to extend to the villagers the opportunity of being treated. If treatment is held out to them as a preliminary first step, they refuse; but after they have been brought to install latrines in large numbers and to realize the benefits attending their use, effective curative work may readily be conducted among them.

SANITATION IN THE MINES OF CHINA

In December, 1917, a demonstration in the control of hookworm disease was undertaken in a large mine in China. An infection survey of the Pinghsiang colliery and the immediate mining community, in Kiangsi Province, was the first step in carrying out this demonstration. As a result of conditions revealed by the survey, the mining corporation set aside \$20,000 (Mexican) to be expended in sanitating its mines, and on April 6, 1918, the systematic examination and treatment of the employes was begun.

Organization of Permanent Sanitary Department. Part of the \$20,000 appropriated by the mining corporation will be used to establish a permanent sanitary department. This department will take over the work against hookworm disease as soon as the initial demonstration has been completed. A well-trained Chinese sanitary engineer is to be appointed to direct the new department. The company has three assistants also attending the office regularly to learn all details of the campaign, and has employed a special attendant to look after latrines.

Provision of Sanitary Conveniences. Before the demonstration measures are completed, there will be sufficient sanitary toilets, both above and below ground, to provide accommodations for all surface and underground workers. In the mines the pail system of latrine, with careful inspection and frequent emptying of the contents of the pails, is being employed. On the surface the open latrines previously used at the four boarding-houses where the company's employes live, have been filled in and replaced by new latrines of the pit type, each costing between \$800 and \$1,000 (Mexican), and other smaller latrines are under construction where needed. The large latrines at the boarding-houses will provide accommodations for approximately 2,000 persons.

Installation of Pits for Storage of Feces. Eleven pits have been erected in the company's vegetable gardens, where it is proposed to store feces for such time as may be required to render them innocuous. In China the commercial value and wide-spread use of

feces for fertilizing purposes complicates the problem of hookworm control and makes it especially difficult to prevent soil contamination. The eleven pits in the vegetable gardens will provide opportunity for studying the viability of hookworm ova and larvae in feces and for determining whether storage for a sufficient length of time to kill the eggs and embryos will lower or destroy the commercial value of the feces. The Chinese farmers have a maxim that the older the feces the greater its potential fertilizing value, and it may be that this precept, coupled with facilities for storage, will provide the solution of the problem.

Control Regulations as Part of Future Mining Concessions. The sanitation of working conditions and the examination and treatment of applicants before employment, are fundamental factors in permanently ridding the mines of China of their hookworm infection. If the Government should decide to insert in all future mining concessions granted by its central and provincial mining bureaus, a clause requiring proper sanitation and provision for the treatment and cure of infected employes before the mines are opened, such provision would go a long way toward the eventual control of the disease. One of the objects of the work at Pinghsiang is to demonstrate the need for such action.

SOIL SANITATION IN BRAZIL

The campaign on Governor's Island, in Brazil, resulted in providing latrine accommodations for more than 7,000 people. The co-operation of the Federal Health Service was all that could be desired. Of 1,140 homes, 911, or 80 per cent, were without any kind of latrines on first inspection, and only 206, or 18 per cent, had acceptable latrines. On last inspection 99.4 per cent of the houses had latrines either already erected or in course of construction. This means that every house in the area except seven belonging to public departments—on which notices to install latrines could not legally be served—were either provided with latrines or had them under construction. Steps are already under way to secure the erection of latrines at the seven public buildings. A sanitary inspector appointed and paid by Government will remain permanently in this area to superintend completion of the work, and to see that the provisions of the sanitary code for the Federal District are properly observed in future.

Erection and Use of Latrines in Rio Bonito. There was also considerable sanitary improvement during the year in the typical rural community of Rio Bonito, located in the State of Rio de Janeiro. In the town proper there are 2,500 inhabitants. Here, at the close of the year, two-chamber septic tanks with subsoil effluents had either been installed or were under construction at

practically all the homes. On the larger farms the proprietors had built pit latrines, and similar latrines had also been installed at a large number of private homes throughout the remainder of the rural area. All this was accomplished without recourse to legal process and entirely at the expense of the proprietors. In this area, however, there are many temporary habitations which will make it impossible to report the erection of latrines at 100 per cent of the homes.

PROVISION OF CARPENTERS TO BUILD LATRINES

Initial inspection in the North Queensland district of Australia showed that 96 per cent of the 3,023 homes were provided with unsafe latrines, or with no latrines at all. Corps of carpenters were employed to undertake the task of systematically remodeling all the latrines in the area. For this purpose an initial expenditure of approximately \$7,500 has been made by the householders. A second inspection of the same premises several months later showed 1,310, or 45.0 per cent, of the latrines to be safe. Alterations were in progress on all the others. In addition, several towns have let contracts for incinerators for night soil disposal, to cost approximately \$5,000 each.

INSTALLATION OF LATRINES IN THE SEYCHELLES

A recent survey of Mahe, Praslin, and LaDigue, the three largest islands of the Seychelles group, indicated that excellent progress was being made toward the provision of latrine accommodations for all the homes. Of 513 homes located on the island of Praslin, 481, or 93.8 per cent, had unusually well-constructed latrines, and all thirty-two of the houses recorded as not having latrines really had latrine accommodation. Many of the houses are so close together that it is unnecessary for each to have a separate latrine.

Sanitation of the Soil in Advance of Treatment. On Praslin and LaDigue, where curative work had not been attempted up to the close of the year, 98 per cent of the homes had good pit latrines. The majority of these were built as a result of Government regulations enacted in 1917, requiring latrine accommodations at all the homes. Thus, practically complete sanitation has been provided on these Islands in *advance of the treatment campaign*. Furthermore, the Government of Mauritius has recently given \$32,400 to the Seychelles Government, and the Governor has sanctioned the use of as much of this as may be necessary for the installation of public latrines at the most convenient locations throughout the Seychelles.

LATRINE BUILDING IN SIAMESE VILLAGES

In Siam, up to December 31, 1918, three liquefaction tanks and 224 protected pit latrines had been installed in the city of Chiangmai, and 977 pit latrines in neighboring villages. These figures include only the latrines that were inspected and found satisfactory; they take no account of large numbers of additional latrines erected in localities so remote from the regular headquarters of the work that it was not possible to arrange for their inspection.

Outlook for Advance Sanitation in Siam. The rivalry between the Siamese villages to secure the benefits of examination and treatment for hookworm disease sometimes makes it possible to insist, as a prerequisite, that adequate latrine accommodation shall be provided before curative measures are undertaken. The Viceroy and the Commissioner of Chiangmai called in July a conference of mayors of the entire province to discuss the question of sanitation. This led the mayor of Muang Prao to order latrines installed at every home within this village, and the mayor of Payang to issue a similar order to the householders of an entire township. Much progress has been made in preparing the way for these sanitary laws by the work of education.

SANITARY ADVANCE IN WEST INDIAN COLONIES

In the West Indies the Government of Dutch Guiana has enacted a code of sanitary laws, is organizing a sanitary force with clearly defined authority to control soil pollution, and has proceeded with its sanitary program during the period that the curative work has been in suspension. The Government of Grenada is making satisfactory progress in having a uniform type of latrine installed in rural areas. Jamaica is organizing a sanitary department and arranging to carry out advance sanitation in the areas where the people are to be examined and treated. The Governor of Trinidad has appointed the Board's director an honorary member of the Central Board of Health of the Island, and has also assigned to the Department of Ancylostomiasis an unusually competent inspector who will carry out advance sanitation in the areas where work is to be undertaken. A committee of the Central Board of Health is making a study of the most satisfactory types of latrines for use in rural and semi-urban districts, and this committee will make a special report on the subject to the Island government. In the Santa Cruz area of this Island practically all the homes have been provided with latrines, and the majority of the people have formed the habit of using them. The sanitary campaign started before the curative work was under way, and continued actively and efficiently as long as the area was under treatment.



Fig. 38.—New concrete latrine for public use.
Panama



Fig. 39.—Placing frames with wire mesh in new type of concrete latrine. Panama

LATRINE BUILDING IN CENTRAL AMERICA

In Central America, exceptional difficulties stand in the way of all privy work undertaken. Most of the people are so poor that they find it difficult to sustain existence, and the construction of latrines, when required by Government ordinance, imposes upon them a financial hardship that in many cases cannot be borne. Of the five Central American republics in which work has been conducted, Nicaragua, Costa Rica, and to a lesser extent Guatemala, are the only ones that have been able to report substantial accomplishments in sanitary improvement. In Costa Rica, latrines were erected or improved at 5,134 homes during 1918. In the same country the number of public schools provided with sanitary latrines was increased from ninety-five in 1915 to 132 in 1917. In a few instances in Nicaragua, too, thoroughgoing sanitary reform has accompanied the curative work. On the coffee plantations of Guatemala, latrines sufficient to provide accommodations for more than 80 per cent of the laboring population were installed, but it is doubtful if all these are regularly used. The Indian laborers are not accustomed to the sitting posture and are inclined to revert to their primitive habit of fouling the ground. The plantation owners, too, after going to the expense of erecting latrines, frequently do not bring about their use.

Sanitary Progress Through Educational Efforts. In Salvador a few latrines have been installed as a result of urging by staff members and decrees issued by mayors, and the Government has recently provided a corps of mounted sanitary police to assist in the campaign for improved sanitation. In general, however, the situation with respect to sanitation has been unsatisfactory. In Panama there are no laws requiring latrines, the officials sometimes appear to be indifferent, and the people are prejudiced against latrines. Effort here has centered on the construction of at least two concrete latrines of the pit type at each school in the Republic, and of similar public latrines in localities where they will serve the largest number of persons. For this purpose the Panamanian Government has set aside the sum of \$4,000 and has promised to supply an additional appropriation of like amount during 1919. There can be little doubt that the installation of these public and school latrines, taken with the educational efforts of staff members and the benefits resulting from the curative work, are sowing seed that will bear fruit in the future, though it may be necessary to await the rising generations before the full harvest can be reaped.

SANITATION OF THE SOIL IN SOUTHERN STATES

The outstanding features of the rural health work conducted in the Southern States during 1918 were (1) the demonstration that the

special plan of work being followed in North Carolina yields gratifying results in different fields of county health activity and at the same time makes definite progress toward the prevention of soil contamination throughout whole counties; and (2) the installation in Stone and Harrison counties, Mississippi, of an improved privy at every one of their 2,344 rural homes. Harrison was the first county in the South to achieve this enviable distinction: here the work afforded practical illustration of what can be accomplished in health protection and stood out as one of the prominent movements of the year in both the county and the State.

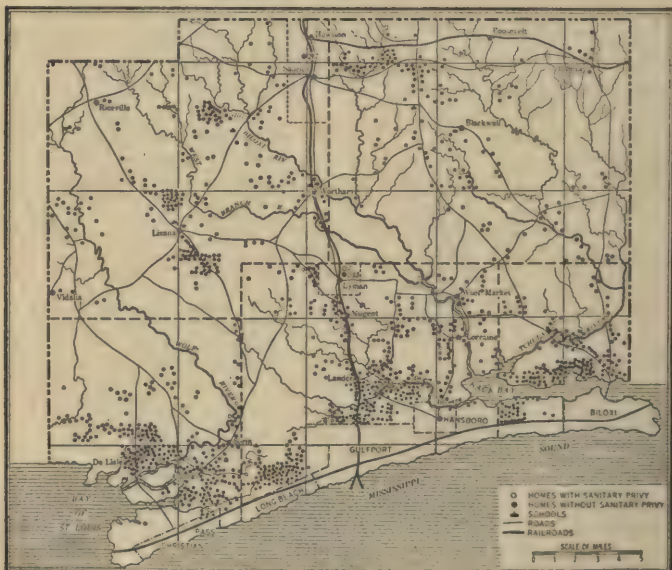


Fig. 40.—Map of Harrison county, Mississippi. At beginning of campaign against soil pollution diseases. Black dots indicate homes with insanitary latrines

Development of Community Sentiment for Adequate Latrines. In ten Southern States, a total of 4,586 new privies were erected and 15,568 old privies improved during the year. In one-fifth of the areas in which work was conducted, a complete record of 100 per cent sanitary installation was obtained. In addition, there was a gratifying development of privy pride in many rural regions of the South, which found expression in the construction not of the cheapest type of privy that would serve the purpose, but of a well-housed, durable structure to form a permanent adjunct of the home. In one community of Tarrant county, Texas, the residents of 180 of the 200 homes voluntarily erected concrete privies which cost

\$35 apiece; not less than 15 per cent of the 441 improved privies constructed in McLennan county, Texas, were of this type; and in Greenwood and Orangeburg counties, South Carolina, there was a distinct leaning toward the septic tank and other more costly, but also more permanent, forms of construction. The development of this individual and community pride was largely fostered by publishing lists of names in local papers or by marking homes on maps posted in public places to indicate that their occupants or owners had made the necessary sanitary improvements. This served as an honor roll and soon brought recalcitrants into line.

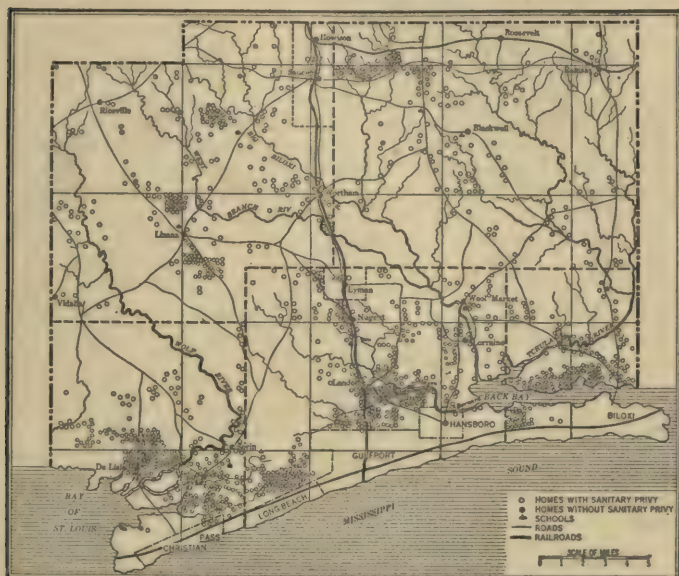


Fig. 41.—Map of Harrison county, Mississippi. At close of campaign against soil pollution diseases. Note entire absence of insanitary latrines

Results of County Health Work in North Carolina. In North Carolina the work of the past fourteen months resulted in the installation of 7,364 sanitary closets in the rural areas of ten counties, to say nothing of extensive sanitary reform in towns and other urban localities. The people were brought to appreciate the value of public health measures in general, and a sustaining public sentiment toward these measures was developed. One result was the enactment at the recent session of the General Assembly of a state-wide sanitary-privy law which requires all privies located within 300 yards of a neighboring home to be constructed and maintained in a

manner satisfactory to the State Board of Health. The law applies to approximately 85,000 privies in the State, and places an annual inspection tax of forty cents on each privy. The funds thus collected will be used to defray the salaries and expenses of from ten to twelve State sanitary inspectors, whose duty it will be to inspect each privy in the State from two to five times a year, to see that the provisions of the law are enforced.

HEALTH IMPROVEMENT FOLLOWING SOIL SANITATION

Data dealing with field conditions can seldom have the scientific accuracy of the laboratory. Nevertheless, results following soil sanitation in widely separated areas are significant.

In Georgia, an intensive campaign against soil pollution was begun in Troup county on January 1, 1918. Prior to this date, there had never been a sanitary pit privy in the entire rural area of the county. In the course of the year, 1,341 of these were installed, and 62 per cent of the people were thus protected from the dangers of soil pollution. A house-to-house survey of the entire county revealed the fact that before the work of sanitation had been undertaken, an average of 496 cases of dysentery and 177 cases of typhoid fever occurred annually. During the year 1918, there were only fifty-eight cases of dysentery, or 12 per cent of the previous average annual incidence, and thirty-two cases of typhoid fever, or 18 per cent of the former yearly average of cases.

In Wicomico county, Maryland, from January 1 to October 1, 1916, the typhoid fever incidence totaled seventy-eight cases; for the same period in 1917, there is a record of seventy-six cases. Investigation indicated that the infection was fly-borne and that its source was the prevalent open privy. In January, 1918, a sanitary and educational campaign, in which special emphasis was laid upon the necessity for the erection of fly-proof latrines, was begun. As a result, one hundred homes a month, on an average, were supplied with sanitary privies during the course of the year. There were but twenty-six typhoid fever cases reported in the county for the period from January 1 to October 1, 1918,—a reduction of 66.2 per cent from the average rate for the two previous years.

In nine counties of North Carolina, during the four-year period from 1914 to 1917, the total number of deaths from typhoid fever was 478. This was a yearly average of 119.5 deaths, or 35.3 deaths per hundred thousand. During 1918, as a result of a crusade against soil pollution in these nine counties, a total of 6,480 fly-proof privies were erected. Typhoid fever statistics for the year 1918 show that out of an aggregate population of 305,016 in these counties, there were only twenty-four deaths from this disease, a rate of 7.8 per hundred thousand.

Reports from these same counties indicate that the reduction in the number of cases of diarrheal diseases among children and in fatalities from these diseases, has been even greater than in the case of typhoid fever. In the town of Lexington, which has a population of about 5,000, the average number of cases of diarrhea among children for the years 1914 to 1917 was approximately 115 yearly. During 1918 the health officer reported only five cases.

A study of the birth and death rates of recent years in Costa Rica furnishes interesting data. During the year 1910, before the work of hookworm eradication and soil sanitation had been begun in that country, the death rate was 26.36 per thousand. Since then, the rate has gradually dropped to 22.52 per thousand for the year 1917. On this basis it may be estimated that the lives saved during the period from 1911 to 1917 number 10,169, or two and one-half per cent of the existing population. In 1910, an average of 201.7 deaths out of 1,000 births occurred among children under the age of one year, while the rate for 1917 was 175.9 deaths per thousand births. The death rate of children under five years was reduced from 328.6 for every thousand births in 1910 to 275 per thousand in 1917.

VIII

MALARIA CONTROL

Demonstrations which have been carried out in a number of different localities within the last three years tend to show that in the average community in the heavily infected regions of the Southern States, malaria can be controlled for less money than it is costing the communities to have it. Thus far, the field experiments undertaken have been of four types, consisting of efforts at malaria control by anti-mosquito measures, by the screening of houses, by the administration of immunizing quinine, and by direct attack upon the parasite in the blood of the human carrier. In conducting these first experiments, no attempt has been made to put into operation a full program of malaria control, but rather to try out the possibilities of some of the more important elements which would enter into such a program.

CONTROL BY ANTI-MOSQUITO MEASURES

The work in malaria control by anti-mosquito measures has been guided by two main purposes: (1) to ascertain to what degree the infection may be reduced in the average small town of the Southern States by applying the simpler measures of malaria control; and (2) to ascertain whether a satisfactory result may be achieved within limits of expenditure which these towns may well afford. In the experimental demonstrations the habits of the three mosquitoes—*A. quadrimaculatus* Say, *A. punctipennis* Say, and *A. cruzians* Wiedermann—which are responsible for the infection, have been made the subject of constant study with a view to eliminating all unnecessary effort and thereby reducing cost.

Experiment at Crossett, Arkansas, 1916. The first of the tests was undertaken at Crossett, a lumber town of 2,129 inhabitants, situated in Ashley County in southeastern Arkansas, about twelve miles north of the Louisiana line. It lies at the edge of the so-called "uplands," in a level, low-lying region (elevation 165 feet) with sufficient undulation to provide reasonably good natural drainage. Climatic conditions and abundant breeding places favor the propagation of anopheles. Malaria in its severe form is widely prevalent as an endemic infection, and according to the estimate of local physicians is the cause of about 60 per cent of all illness throughout the region. Within the town itself the malaria rate was high and was recognized by the lumber corporation and the people as a serious menace to health and working efficiency.

The initial step in the experiment was a survey of the community to determine the malaria incidence, to ascertain the species of mos-

quitoes responsible for the spread of the infection, and to locate the breeding places of these mosquitoes. Breeding places were exhibited on a community map, and organized effort was centered on their destruction or control. The program of simple measures excluded all major drainage. Borrow pits and shallow ponds were filled or drained; streams were cleared of undergrowth where necessary to let the sunlight in; their margins and beds were cleared of vegetation and obstructions; and they were trained to a narrow channel providing an unobstructed off-flow. Artificial containers were removed from premises; water barrels on bridges were treated with nitre cake. All remaining breeding places were regularly treated by removing vegetation, opening up shallow margins to give free access to small fish, and spraying once a week with road oil by means of automatic drips or a knapsack sprayer. All operations were under the supervision of a trained lay inspector. Care was exercised to avoid all unnecessary effort, and to secure, not the elimination of the last mosquito, but a reasonably high degree of control at a minimum cost.

The first conspicuous result apparent to every person living in the community was the practical elimination of the mosquito as a pest. The reduction in malaria as shown by a parasite index taken in May, 1916, and again in December of the same year, was 72.33 per cent. The reduction in physicians' calls for malaria in 1916 as compared with the number of calls for the previous year (company's records) was 70.36 per cent. The per capita cost of the work—omitting overhead—was \$1.24. During the year the Crossett Lumber Company had repeated these measures at two of its large logging camps with results which were convincing as to the soundness of the investment.

At the end of 1916 the community took over the work and for two years has maintained it at its own expense and under its own direction. The measures have been continued under the supervision of a trained native lay inspector. Figure 42, page 188, exhibits in graphic form the results for the three years.

Physicians' Calls for Malaria

Population.....	2,029	
1915 calls.....	2,500	
1916 ".....	741	} (company's records)
1917 ".....	200	
1918 ".....	73	
Reduction for the three years.....	97.1	%

Per Capita Cost

1916 (omitting overhead).....	\$1.24
1917 (total cost).....	.63
1918 (total cost).....	.53

Results Confirmed at Hamburg—1917. After the work at Crossett had been turned over to the community, operations were transferred to the neighboring town of Hamburg, with a view to putting the practicability of anti-mosquito measures to test under

somewhat more difficult conditions. Hamburg was not governed and financed by a wealthy corporation; it had no hospital; it depended for medical service upon private practitioners who were deriving about 60 per cent of their income from malaria; the town was less compact, and with only 1,285 inhabitants had a higher malaria rate and more abundant breeding places for mosquitoes than had Crossett.

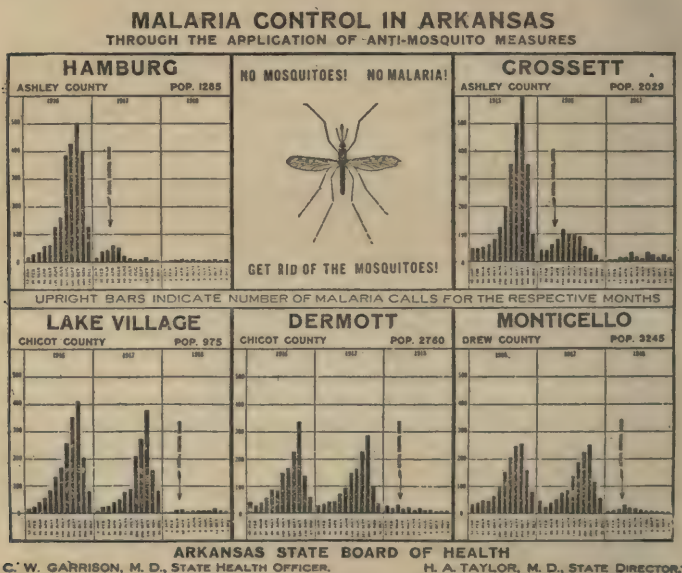


Fig. 42.—Record of malaria control in five Arkansas towns, 1916–1918

The measures which had stood the test of the previous year at Crossett, with the introduction of certain economies which experience had suggested, were repeated here. Physicians' calls were reduced from 2,312 in 1916 to 259 in 1917—a reduction of 88.8 per cent. For the latter half of the year—July to December inclusive—there were only forty-three calls for malaria in 1917 as compared with 1,995 calls for the same period the previous year—a reduction of 97.8 per cent. The per capita cost—omitting overhead—was \$1.45.¹

¹ The overhead omitted comprises, in addition to general supervision, expenditures for outside surveys, for blood examinations, etc., which are desirable as affording useful information but are not properly a part of the cost of control operations in the given community. The costs as given include all capital expenditures and the complete local organization necessary to the conduct of the work.



Fig. 43.—Borrow pit before draining. Malaria control by anti-mosquito measures. Hamburg, Arkansas



Fig. 44.—Same borrow pit after draining

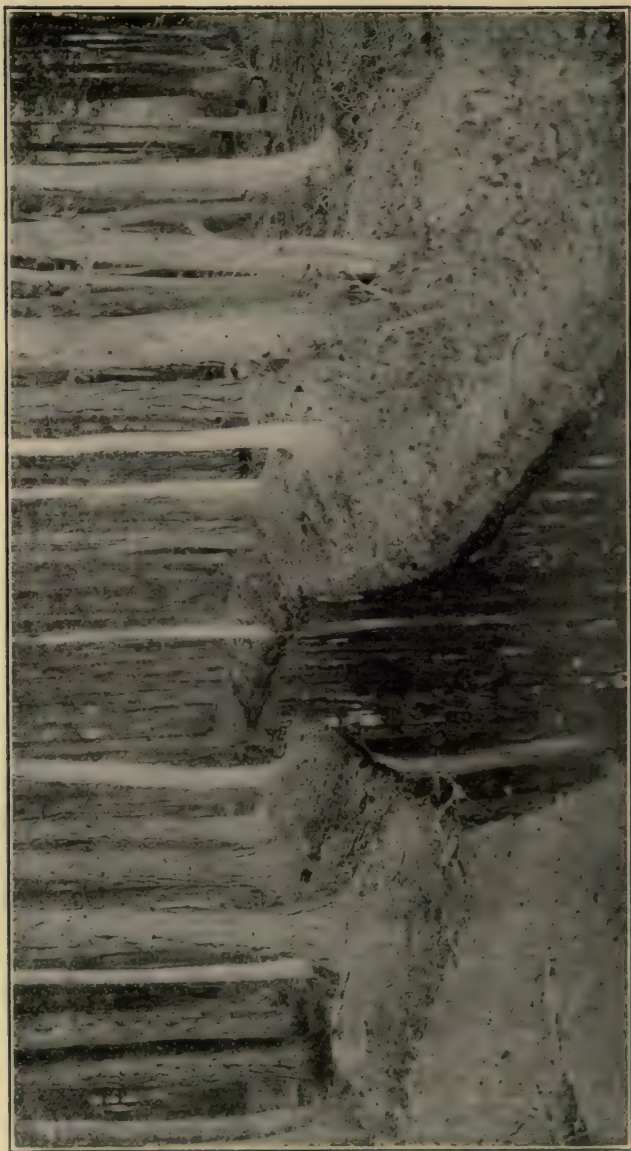


Fig. 45.—Drained swamp. Malaria control by anti-mosquito measures

At the end of the year again the community took over the work, assuming entire responsibility for its continued maintenance and direction. Figure 42, page 188, exhibits graphically the results for the two years. As a result of community effort during 1918, the total calls for malaria fell to fifty-nine, and the work was maintained at a per capita cost of forty-four cents.

Physicians' Calls for Malaria

Population.....	1,285
1916 calls.....	2,312
1917 ".....	259
1918 ".....	59
Reduction 1916-1918.....	97.4 %

Per Capita Cost

1917 (omitting overhead).....	\$1.45
1918 (total upkeep).....	.44

Demonstration in Four Communities—1918. Taking as a basis the plan of operation which had been tried at Crossett and further developed and confirmed at Hamburg, effort was made during 1918 to carry out a demonstration on a somewhat larger scale and under a variety of conditions. For this purpose four small Arkansas towns were selected. They are rural towns ranging in population from 975 to 3,023. Lake Village, county seat of Chicot

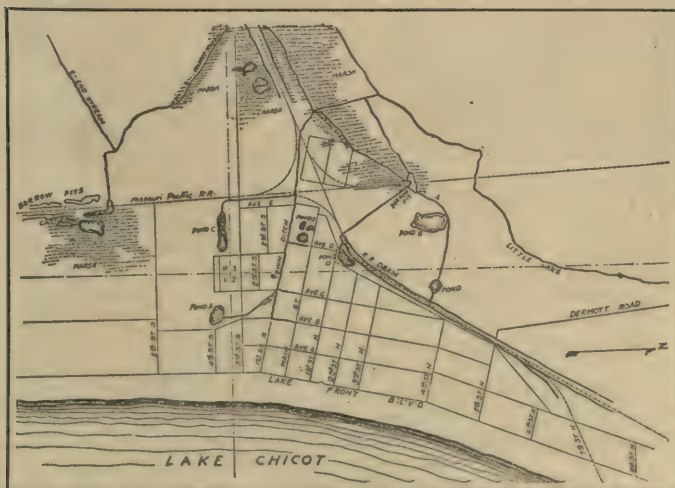


Fig. 46.—Map of Lake Village, Arkansas, showing Lake Chicot and main natural drainage system. Malaria control by anti-mosquito measures

County, presented the problem of a level, low-lying area of buckshot soil with two miles of lake frontage and an extensive area of shallow swamp in the rear. Dermott, about twenty miles away, also in the flat lands of the Mississippi, presented the peculiarity of having abundant anopheles breeding places throughout the municipal area, due chiefly to the utter neglect of the most elementary principles of drainage in the grading of two railroads and the streets of the town. Monticello, county seat of Drew County, is a typical hill-town for which a number of clear streams, with adequate fall over a stiff clay soil, furnished an abundant supply of anopheles. Bauxite, a rambling mining community of about 2,500 inhabitants, presented the difficulties of a large area to be treated, a heavy sand-flow in the beds of its numerous small streams, and extensive hillside seepage areas offering ideal breeding conditions.

A preliminary survey of each community at different seasons during the previous year made it possible to omit from the working plans much that otherwise would have been waste effort. Each community was presented in advance with an estimate of its malaria prevalence, a chart exhibiting its breeding places, a working plan with budget, and an estimate of what might be expected as a result in degree of malaria control. The community in each case provided the funds required save for general supervision, and agreed to assume entire responsibility for the work after the first year.

The plan of operation followed at Crossett and Hamburg, with improvements suggested by experience and adaptations to local conditions, was repeated in each of these towns. For the four communities combined, physicians' calls for malaria were reduced from 5,065—the average for the two previous years—to 554, a reduction of 89.1 per cent. The per capita cost of the entire work—omitting general overhead—was 74¢. Results and costs by communities (except Bauxite) are graphically exhibited in Fig. 42, page 188.

Results and Costs by Communities

	Lake Village	Dermott	Monti- cello	Bauxite
Population.....	975	2,760	3,023	2,500
Physicians' calls for malaria:				
1916.....	1,817	1,399	1,413	862
1917.....	1,388	1,248	1,274	729
1918.....	83	162	137	172
Per cent reduction, 1917-				
1918.....	94.8	87.8	89.8	78.4
Per capita cost, 1918....	\$1.25	\$0.54	\$0.46	\$1.11

Comparison of cost of operations with results accomplished in these six towns tends to show that malaria control in such communities, considered merely as a business proposition, pays. At two dollars per physician's call, Crossett has been paying annually more

than four and one-half times as much in doctors' bills alone, for the privilege of having malaria, as it expended in 1918 for the upkeep of the work which kept it practically free from malaria and from the mosquito as a pest. Hamburg's annual doctors' bill for malaria had been eight times the cost of protection in 1918. In the four new communities the annual payment for physicians' calls would cover even the relatively heavy cost of first year operations almost one-and-a-half times over. And the doctors' bill is but an insignificant fraction of malaria's total cost to the community.

CONTROL BY SCREENING

For communities situated as those described above, there seems to be little need of resort to other procedures than those directed against mosquitoes. The control of malaria in towns, however,—even in small towns—does not reach the heart of the matter. Malaria is essentially a rural disease, bearing most heavily on the people and the industries of the farm. There are large rural areas, moreover, where in the light of our present knowledge the control of mosquito breeding is not practicable. Malaria in these localities, if it is to be controlled at all during the pioneer period of settlement, must be attacked from another angle. It has been shown by demonstration that under conditions which make the cost of mosquito control prohibitive, it is still possible to reduce the malaria rate by the screening of houses, by the systematic administration of immunizing quinine, and by detecting the human carriers and destroying the parasites in their blood.

Experiment on Plantations Near Lake Village, Ark. In order to test the efficiency and the cost of screening as a control measure, a field experiment was conducted in 1916 on a group of cotton plantations near Lake Village, Arkansas. The community, which lay along the shore of Chicot Lake, had an abundant supply of anopheles and a high malaria incidence. The houses on these plantations were typical negro cabins, many of them loosely constructed and therefore difficult to protect against entrance by mosquitoes. All selected houses were screened with galvanized wire cloth, 16 mesh, the work being carefully done by carpenters and without cost to the tenants. The people were taught by house-to-house visits the importance of keeping the screens in good condition and the dangers of exposure after dark to mosquitoes on the outside of their homes. Each home was inspected at regular intervals throughout the season. No other measure was employed.

The estimate of result was based on parasite index. An index taken in May, 1916, when the work began, showed an infection of 11.97 per cent; a second index taken in December of the same year showed an infection of 3.52 per cent, a reduction of 70.6 per cent.

Unfortunately, the index for May, 1917, which would have afforded a more instructive comparison, is wanting. On a visit during the season of the following year it was found that the screens were still in good repair and that the people—mainly typical plantation negroes—were convinced of their value. The average cost of screening for the community was \$14.59 per house. Estimating the life of the screen at two years, the average annual cost would be \$7.29. On this basis the annual per capita cost of the screening alone was \$1.75.

CONTROL BY IMMUNIZING WITH QUININE

In another plantation community, immunizing quinine as a control measure was put to similar test. This second community lay along the bank of a sluggish bayou, from which it derived its supply of anopheles. Under the direct supervision of the physician in charge, quinine was administered to all persons in the community in doses of five grains morning and evening—making ten grains a day—for two successive days each week. For children under fifteen years of age the dosage was reckoned at one grain for each three years and was administered in the same way. A parasite index taken in May, 1916, at the beginning of the work, and again in December of the same year, showed a reduction of 64.45 per cent. Again the omission of the index for May, 1917, must be regretted. The per capita cost of the work, omitting the overhead, was fifty-seven cents.

These tests in malaria control by screening and by the administration of immunizing quinine are to be regarded as preliminary and their results as suggestive only. Generalization may be attempted only when they have been carried out on a much larger scale under a variety of conditions and with a more reliable measure of results.

CONTROL BY TREATING THE CARRIERS

Since all infected mosquitoes have derived their infection from the blood of infected persons, it is theoretically possible to prevent the infection of mosquitoes and thereby prevent the spread of malaria in a community by destroying the parasites in the blood of the human carrier. Robert Koch first suggested the possibility of controlling malaria by the treatment of carriers during a visit to Italy in 1898, and in 1900 demonstrated his theory by a definite reduction of the malaria rate in a small community of 734 persons at Stephansort, German New Guinea. The measure has been rather widely employed in German colonies and with varying degrees of success. Malaria has been reduced, but in no community does the method seem to have been put to an adequate test and with sufficient attention to measure of results and to counting of costs.

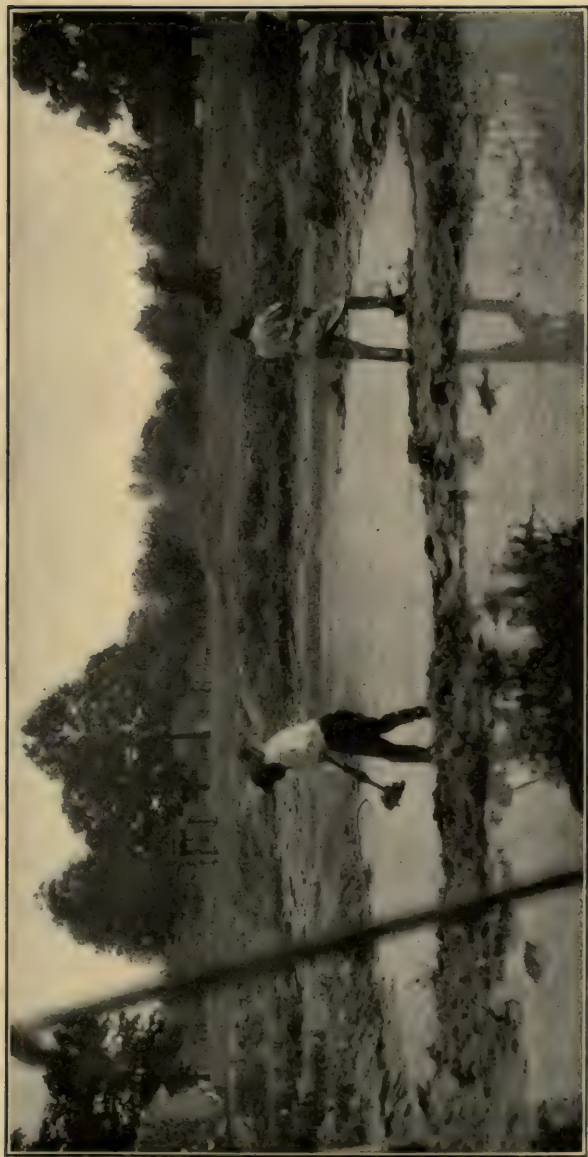


Fig. 47.—Laborers at work filling borrow pit. Anti-mosquito operations. Hamburg, Arkansas

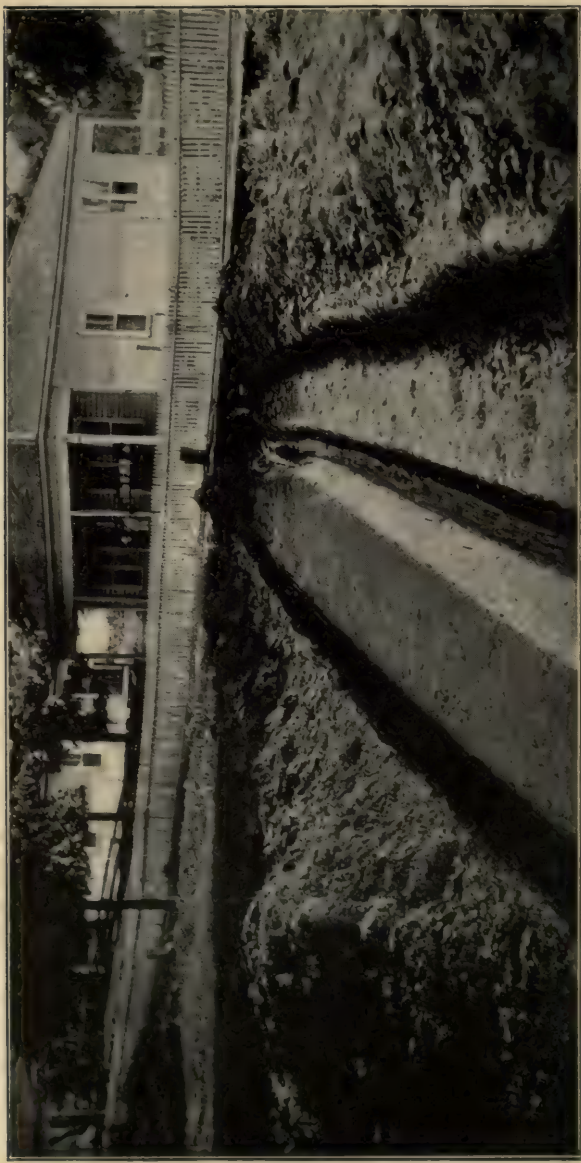


Fig. 48.—Wide ditch for heavy rains, with “V”-shaped center for normal flow.
Anti-mosquito measures. Monticello, Arkansas

Initial Experiment in Bolivar County, Mississippi, 1916-1917. As a preliminary study, a two-year field experiment—in which more than 30,000 persons were registered—was conducted in Bolivar County, Mississippi, during 1916 and 1917. The large number of blood examinations confirmed with emphasis the importance of the malaria carrier. Persons who have had clinical attacks are apt to carry the parasites in the blood for months after the clinical symptoms have disappeared. The examinations showed also that the usual doctor's treatment of malaria, although breaking the chill and sending the patient back to his work, does not, in most cases, sterilize his blood. The results of the chill tonics upon which so many people depend, are still less satisfactory. A very large percentage of malaria cases treated by physicians or by the use of chill tonics continue to carry the parasites for months after apparent cure, and to be therefore subject to relapse and a possible source of infection to others. These tests furthermore established the fact that ten grains of quinine a day for eight weeks sterilized the blood of about 90 per cent of the carriers to whom it was administered.¹

With this standard course of treatment established, effort was made during 1918 to carry out a test demonstration in malaria control by treating the carriers.

Test Demonstration in Sunflower County, Mississippi, 1918. For purposes of the demonstration a typical rural area was selected in Sunflower County, Mississippi. This area, like the delta region in the heart of which it lies, is level, low-lying, and covered at frequent intervals with a net-and-patchwork of sluggish streams, bayous, and swamps. Mosquito breeding is abundant throughout the season and the cost of its control under present conditions is prohibitive. The area contains about 100 square miles and a population of about 9,000, about 1,000 of these living in the town of Ruleville and about 8,000 on cotton plantations under typical delta conditions. The blacks outnumber the whites by about four to one. Most of the negroes can read, but as compared with a white population living under similar conditions the grade of intelligence is relatively low. The dominant industry of the region is the growing of cotton; and the life of the community centers in and revolves about the cotton plantation. There are relatively few small farms operated by their owners, the prevailing type being the large plantation operated with negro tenant labor under the supervision of a resident manager.

The disabling disease of the region is malaria. At cotton cultivating and picking time, when labor is in greatest demand and when delay means direct money loss, malaria is most severe. It is estimated that from one-third to three-fourths of the people on these plantations have one or more attacks of malaria each year, and that

¹ There is reason to believe that this result does not hold for all conditions. It seems to be much more difficult, for example, to sterilize the blood of carriers in certain tropical regions.

70 per cent or more of all sickness disability in the community is due to this cause. On one plantation, for example, having a tenant population of about 600, the average annual doctors' bill for the last ten years has been approximately \$4,000. Of this sum about \$3,000, or \$5.00 per capita, is attributed by the manager to malaria. The loss to the tenant and to the landlord in crop returns is much larger. And since the landlord must look to the tenant's crop both for return on his capital investment in land and equipment and for reimbursement for his large current advances to his tenant families, he is most deeply concerned in any condition which impairs the health and efficiency of the workers on his plantation.

The first step in the demonstration was to map the area, locating roads, streams, and homes; to take a census of the population; and to make a survey involving a record of each person on the census roll. This survey showed that of the rural population 40 per cent had had clinical malaria within twelve months; and that of the remaining 60 per cent who had not had a clinical attack, 22 per cent had the parasites in their blood. All persons giving a history of clinical malaria within twelve months, and those who were found by blood examination to be carrying the parasites, were given sterilizing treatment—namely, ten grains a day for eight weeks. Effort was made by personal instruction and by repeated house-to-house visits to have the prescribed course of treatment followed to the end. Irregularities occurred and are under such conditions inevitable, but in general the instructions were followed. In the rural area no other measures were employed.

In the town of Ruleville malaria control was based in the main on anti-mosquito measures. Here inspection disclosed the fact that mosquito breeding, which was abundant, was due almost exclusively to running hydrants and leaking pipes supplied by flowing artesian wells. The problem was extremely simple. The enactment of an ordinance followed by the imposition of a number of fines resulted in the destruction of breeding places and the consequent extermination of mosquitoes in the town.

Results. Unfortunately no reliable record is available of the number of physicians' calls within the area before the work began, and the second parasite index will not be taken until next season. The results of the test, in so far as they may be estimated in advance of the final report, may be summarized as follows:

1. There has been no transmission of malaria within the town of Ruleville during the year, and the town has been free from the mosquito as a pest.

2. The degree of malaria control resulting from the measures carried out in the rural area is estimated by the director in charge at approximately 80 per cent. This estimate is based on the record of malaria histories, intimate observation during the season, informal reports by tenants and plantation managers, and regular monthly reports submitted by physicians.

3. Physicians practicing within the area report a marked decline in malaria cases.

4. Plantation owners and managers operating within the area are of one accord in reporting an obvious decrease in malaria as compared with previous years. One manager, for example, operates a large plantation within the demonstration area and a smaller one outside the area. The plantation under control has a tenant population of about 600, the one not under control about 180. The doctor's bill for the year on the smaller plantation has been greater than on the large one. This difference he attributes altogether to the malaria control on the larger plantation.

5. These reports and estimates were checked by personal inspection on a recent house-to-house visit among tenant families on the plantations and among families in a community of small landed proprietors. The following record of the first ten families visited typifies the result:

Order of Visit	Number in Family	Positive Malaria History	Negative History but Parasites in Blood	Malaria This Year
1	12	10	0	3
2	6	4	0	0
3	4	0	1	0
4	2	0	0	0
5	8	0	2	0
6	7	1	5	0
7	4	3	0	0
8	9	9	0	0
9	1	1	0	1
10	5	4	0	0
TOTAL	58	32	8	4

PERCENTAGE OF REDUCTION, $87\frac{1}{2}$

Summary

Population rural area.....	8,000
Estimated degree of control.....	80 %
Per capita cost.....	\$1.08
Per capita cost for Ruleville.....	\$.41

Neighboring counties in Mississippi have asked that the work be extended to them and have indicated a willingness to provide the funds. The demonstration, however, is only begun. It is suggestive but far from complete. No conclusion will be attempted until the test has been continued over a period of years within the same area, has been tried under a variety of conditions, and has been submitted to a more definite measure of results.

SUMMARY OF RESULTS AND CONCLUSION

By way of summary it may be said:

1. That for the average town in our Southern States having a thousand or more inhabitants and a reasonably high infection rate, malaria control by anti-mosquito measures is economically feasible; that it is, in fact, a sound business investment.

2. That in heavily infected regions where the cost of mosquito control would be prohibitive, the amount of malaria may be greatly reduced by resort to screening, to immunizing quinine, or to destroying the parasites in the blood of the human carriers. The indications would seem, in fact, to justify the hope that by the systematic application of these measures the malaria in a community may be held within reasonable bounds and that this result may be accomplished within limits of cost which the average community may well afford.

3. That the people in these communities are prepared to provide the funds by public taxation for malaria control when they have been shown by demonstration that the program proposed will accomplish definite results which justify the expenditure.

4. The results thus far accomplished would seem to justify continuing these field experiments until the principal procedures which have been found useful in controlling malaria have been pretty thoroughly tested separately and thus evaluated. It will then be possible to operate intelligently a combination program in which each control measure will be given its place and will receive varying emphasis from time to time according to the local conditions which have to be met. This freedom in the use of our tools will in turn contribute toward the object which we have in view; namely, the highest degree of malaria control consistent with a reasonably low per capita cost.

IX

TUBERCULOSIS IN FRANCE

During 1918 the work of the Commission for the Prevention of Tuberculosis in France was continued under four departments or divisions: the Educational Division, the Medical Division, the Department of Nursing, and the Department of Extension. The main activities of each of these departments are summarized below:

EDUCATIONAL DIVISION

The educational division carried on four types of activity during the year: (1) traveling exhibits; (2) the distribution of literature; (3) publicity in newspapers and magazines; and (4) miscellaneous.

Traveling Exhibits. Three traveling exhibits were active during the year, and at the close of the year a fourth and fifth were being prepared for operation. The further development of this particular activity will depend upon the general conditions in France, and the feasibility of extending this work under the mechanical and other difficulties which now exist.

During 1918 the traveling exhibits visited ten departments. In seven of these their work was completed. The plan has been to hold meetings and campaigns in all communities with a population of over 3,000. In the departments already visited 141 such towns have been reached, and 875 lectures with demonstrations and exhibits have been given. So far as possible this work is followed up in each department and community with a view to the organization by the French people of permanent activity in the several centers.

Literature. From time to time, posters, pamphlets, and other material dealing with tuberculosis, of which there is now a fairly comprehensive series, have been published. This printed matter has been distributed widely throughout the whole of France. During the year, 2,115,708 pieces of printed matter were distributed.

General Publicity. The co-operation of the French press has been gratifying. A series of twenty-four articles on tuberculosis, furnished by the Commission, has been published by thirty-three important provincial newspapers, and a large amount of additional space has also been obtained in these and various other departmental journals.

Miscellaneous. The Commission also co-operated with the Children's Bureau of the American Red Cross in the large exhibits held by the latter organization in Lyons, Marseilles, St. Etienne, and Toulouse. A tuberculosis exhibit was placed in the larger exhibit

of the Children's Bureau and a fairly complete series of educational panels and some models thus presented. A large amount of literature was also distributed. In the four towns mentioned there was an attendance of over 300,000 people.

MEDICAL DIVISION

Following the plans adopted in 1917, the medical activities carried out during 1918 were largely concentrated upon the two demonstrations, one in the 19th arrondissement of Paris and the other in the Department of Eure-et-Loir. In the 19th arrondissement three model dispensaries with full personnel were operating at the close of the year, and a fourth, which will be the central dispensary, was about to open. Four central dispensaries, one in each arrondissement, were in active operation in the Department of Eure-et-Loir, and six secondary dispensaries had been established and were in operation.

Opening of Additional Branch Dispensaries. Six additional secondary dispensaries for the Department of Eure-et-Loir had been nearly completed and were to commence operations early in 1919. Seven other secondary dispensaries had been determined upon and the sites for their installation obtained, although actual construction had not begun. When these have been established the Department of Eure-et-Loir will

have twenty-three dispensaries well distributed, and with the addition of one or two others the equipment of that Department, in so far as dispensaries are concerned, will be complete. The cost of establishing these dispensaries is very slight and is for the most part provided by funds obtained from the French themselves, or, as was the case in certain instances in the past, from the American Red Cross.

Hospital Beds and Sanatorium for Early Cases.

The French have already provided or given definite assurance of providing additional hospital beds in the four chief towns of the Department. The Department has also taken the initial steps toward the estab-



Fig. 49.—Tuberculosis dispensary organization in Department of Eure-et-Loir. France

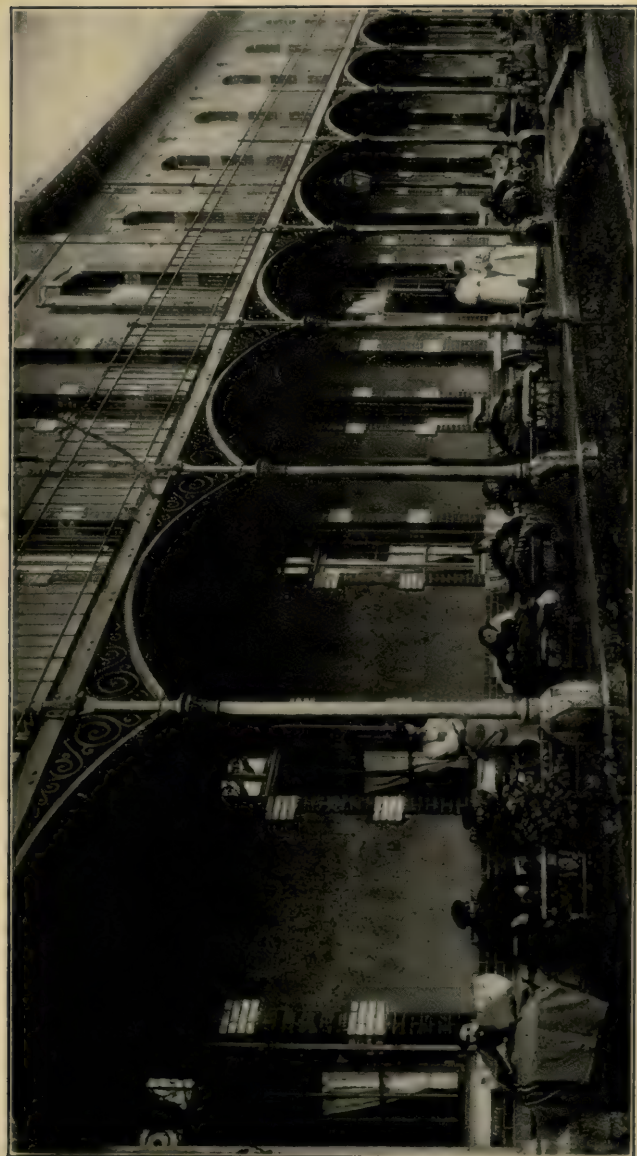


Fig. 50.—Improving open-air treatment of tuberculosis. Chartres, France

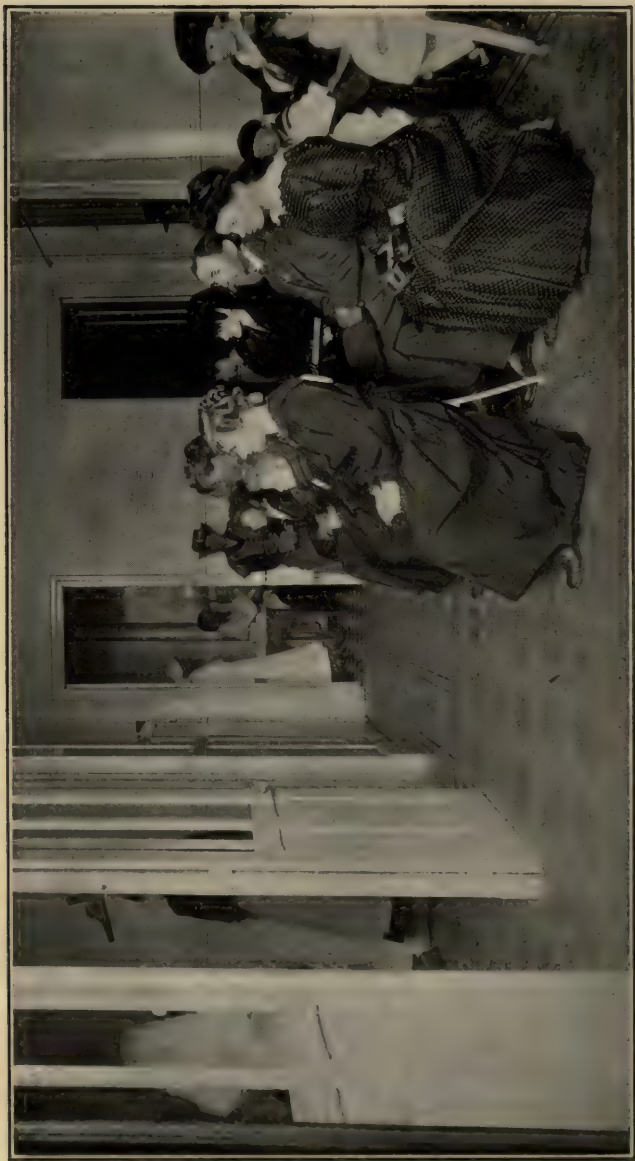


Fig. 51.—Waiting-room of tuberculosis clinic at Chartres, France

lishment of a sanatorium for early cases of tuberculosis, and there is little doubt that this project will be brought to a successful issue. The general equipment of the Department of Eure-et-Loir, from the point of view of the tuberculosis problem, may therefore be regarded as approximately complete. It is particularly gratifying, too, that each of the communities in which dispensaries are situated has organized French committees to provide the necessary material relief that was formerly obtained through funds from the American Red Cross.

DEPARTMENT OF NURSING

Forty-five visiting nurses, or *Visiteuses d'Hygiene*, as they are technically termed, were in active service for the Commission on December 31, 1918. Of these, twenty-two were in Paris and one in Versailles; fifteen were working in connection with the dispensaries in the Department of Eure-et-Loir; and seven were situated in other

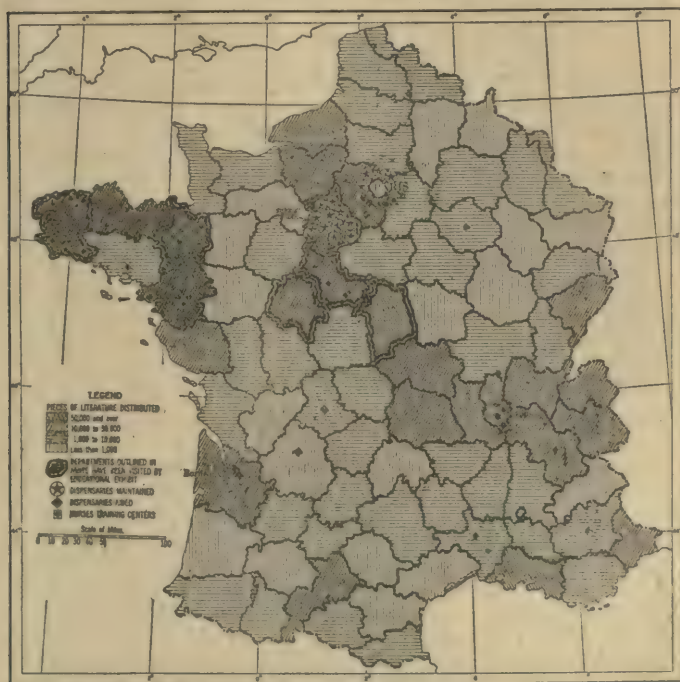


Fig. 52.—Work of Tuberculosis Commission in France, to December 31, 1918

parts of France in dispensaries operating entirely under French auspices. Two *Visiteuses d'Hygiene*, trained in the Commission's dispensaries but paid by local French organizations, were also working in co-operating dispensaries in Paris. Similarly, two others were in Bordeaux, working in dispensaries operated by that municipality and acting as supervisors in a training center which has been organized in that city.

Training Schools for Nurses. At the close of the year, there were three training schools for *Visiteuses d'Hygiene* in Paris, attended by thirty-three pupils for whom scholarships had been provided. In addition, twelve pupils who had been furnished scholarships were completing their training in dispensaries located in the 19th arrondissement of Paris; seven other pupil nurses were in the training center at Bordeaux; and four scholarships had been granted to pupils in a training school at Lyons organized in co-operation with the Commission. An additional training center had been opened in Nantes, but enrolment figures were not at hand.

DEPARTMENT OF EXTENSION

The task of stimulating the organization of anti-tuberculosis work in the various departments and communities of France was met as far as adequate personnel was available. The response by the French people has indeed been gratifying. The American Red Cross and the Commission have carried on activities of greater or less extent in twenty-seven departments of France. In these twenty-seven departments, twenty-one dispensaries were in existence at the time of the first visits. During the year fifty-seven new dispensaries were organized and were functioning at the end of the year. There were also twenty dispensaries definitely provided for and in process of installation; and forty-nine other dispensaries definitely planned for, the installation of which could be reasonably regarded as assured for the near future. Fifteen laboratories had been established or arranged for; thirty-eight new nurses had been installed; and forty-two new and active committees had been organized.

Organization of Dispensary System in Other Departments. The bulk of the expense, not only in the establishment and installation but in the maintenance of these activities, is provided from French sources. This field activity, which is after all the main object of the work, is now moving with extraordinary rapidity. Plans are being completed for the establishment by the French of a complete system of dispensaries in the Region du Nord, comprising the five departments recently re-occupied by the Allied forces and restored to France. Demands from numerous departments which have not yet been reached are also under consideration and will be taken up as soon as facilities permit.

TABULAR SUMMARY

TABLE 4: *All Countries—Persons Enumerated in Census, Microscopically Examined, Found Infected, Given First Treatment, and Cured of Hookworm Disease in Areas Completed During 1918, by Geographical Regions. Figures Excluded for Areas in Which Work Was Still in Progress*

GEOGRAPHICAL REGION	CENSUS	MICROSCOPICALLY EXAMINED		FOUND INFECTED		GIVEN FIRST TREATMENT		CURED	
	Number	Number	Per Cent	Number	Per Cent	Number	Per Cent	Number	Per Cent
Total.....	..	..	..	..	..	215,484	..	126,194	58.6
Southern States ¹	306,267	44,241	14.4	8,074	18.3	7,636	94.6	1,206	15.8
West Indies.....	31,685	31,314	98.8	23,636	75.5	22,057	93.3	17,551	79.6
Central America ².....	..	169,531	..	107,449	63.4	94,176	87.6	42,889	45.5
South America (Brazil).....	11,150	10,490	94.1	6,922	66.0	5,984	85.1	4,107	69.7
The East ³.....	..	..	..	..	..	85,631	..	60,441	70.6

¹ During 1918, in the Southern States, the main emphasis was placed on the building and improving of latrines.

² In Central America the bulk of the work is by the dispensary plan. This does not afford opportunity for frequent re-examinations to determine cure. Consequently the percentage of persons known to be cured is low in comparison with other regions.

³ In Ceylon, throughout a large part of 1918, estate laborers were assumed to be infected, and accordingly were given first treatment without preliminary microscopic diagnosis. This explains the blank spaces for "Census," "Microscopically Examined," and "Found Infected" in the lines for "The East" and "Total."

TABLE 5: Southern States—Persons Enumerated in Census, Microscopically Examined, Found Infected, Given First Treatment, and Cured of Hookworm Disease in Areas Completed During 1918, by States. Figures Excluded for Areas in Which Work Was Still in Progress¹

STATE	CENSUS	MICROSCOPICALLY EXAMINED		FOUND INFECTED		GIVEN FIRST TREATMENT		CURED	
	Number	Number	Per Cent	Number	Per Cent	Number	Per Cent	Number	Per Cent
Total	306,267	44,241	14.4	8,074	18.3	7,636	94.6	1,206	15.8
Alabama	3,713	675	18.2	79	11.7	79	100.0	79	100.0
Arkansas	3,573	500	14.0	3	.6	3	100.0	..	..
Louisiana	5,854	1,161	19.8	208	17.9	55	26.4	..	..
Maryland	9,912	..	..	..	..	..	..	..	..
Mississippi	12,487	8,468	67.8	4,084	48.2	4,069	99.6	84	2.1
North Carolina	212,936	18,431	8.7	3,503	19.0	3,272	93.4	987	30.2
South Carolina	22,825	931	4.1	24	2.6	..	..	..	..
Tennessee	6,904	127	1.8	3	2.4	3	100.0	2	66.7
Texas	19,959	11,025	55.2	81	.7	70	86.4	33	47.1
Virginia	8,104	2,923	36.1	89	3.0	85	95.5	21	24.7

¹ During 1918, in the Southern States, the main emphasis was placed on the building and improving of latrines.

TABLE 6: *West Indies—Persons Enumerated in Census, Microscopically Examined, Found Infected, Given First Treatment, and Cured of Hookworm Disease in Areas Completed During 1918, by Countries. Figures Excluded for Areas in which Work Was Still in Progress*

COUNTRY	CENSUS Number	MICRO- SCOPICALLY EXAMINED		FOUND INFECTED		GIVEN FIRST TREATMENT		CURED	
		Number	Per Cent	Number	Per Cent	Number	Per Cent	Number	Per Cent
Total.....	31,685	31,314	98.8	23,636	75.5	22,057	93.3	17,551	79.6
British Guiana.....	11,856	11,719	98.8	8,727	74.5	8,175	93.7	6,871	84.0
Saint Lucia.....	5,036	5,004	99.4	3,126	62.5	2,892	92.5	2,068	71.5
Saint Vincent.....	1,121	1,117	99.6	955	85.5	884	92.6	766	86.7
Trinidad.....	13,672	13,474	98.6	10,828	80.4	10,106	93.3	7,846	77.6

TABLE 7: *Central America—Persons Enumerated in Census, Microscopically Examined, Found Infected, Given First Treatment, and Cured of Hookworm Disease in Areas Completed During 1918, by Countries. Figures Excluded for Areas in Which Work Was Still in Progress¹*

COUNTRY	CENSUS	MICRO-SCOPICALLY EXAMINED		FOUND INFECTED		GIVEN FIRST TREATMENT		CURED	
		Number	Per Cent	Number	Per Cent	Number	Per Cent	Number	Per Cent
Total .....	..	169,531	..	107,449	63.4	94,176	87.6	42,889	45.5
Costa Rica.....	66,219	56,371	85.1	29,898	53.0	27,487	91.9	12,504	45.5
Guatemala.....	36,151	32,861	90.9	22,299	67.9	19,950	89.5	14,684	73.6
Nicaragua.....	..	19,786	..	15,016	75.9	13,679	91.1	5,773	42.2
Panama.....	..	16,185	..	13,656	84.4	11,966	87.6	4,286	35.8
Salvador	49,564	44,328	89.4	26,580	60.0	21,094	79.4	5,642	26.7

¹ In Central America the bulk of the work is by the dispensary plan. This does not afford opportunity for frequent re-examinations to determine cure. Consequently the percentage of persons known to be cured is low in comparison with other regions.

TABLE 8: *The East—Persons Enumerated in Census, Microscopically Examined, Found Infected, Given First Treatment, and Cured of Hookworm Disease in Areas Completed During 1918, by Countries. Figures Excluded for Areas in Which Work Was Still in Progress*

COUNTRY	CENSUS	MICRO-SCOPICALLY EXAMINED		FOUND INFECTED		GIVEN FIRST TREATMENT		CURED	
		Number	Per Cent	Number	Per Cent	Number	Per Cent	Number	Per Cent
Total .....	..	..	..	..	..	85,631	..	60,441	70.6
Ceylon ¹	61,698	..	..	..	..	50,374	..	44,812	89.0
China .....	..	12,504	..	7,556	60.4	5,694	75.4	2,519	44.2
Fiji	3,222	3,190	99.0	2,887	90.5	2,770	95.9	2,514	90.8
Seychelles	10,524	10,475	99.5	9,113	87.0	8,671	95.1	7,413	85.5
Siam .....	..	31,298	..	24,018	76.7	18,122	75.5	3,183	17.6

¹ In Ceylon, throughout a large part of 1918, estate laborers were assumed to be infected, and accordingly were given first treatment without preliminary microscopic diagnosis. This explains the blank spaces for "Census," "Microscopically Examined," and "Found Infected" in the lines for "Ceylon" and "Total."

FINANCIAL STATEMENT

FINANCIAL STATEMENT

The statement on the following pages shows that in the work of the International Health Board during the year 1918, a total of \$1,121,-585.11 was expended. This statement is based on expenditures actually made during the calendar year 1918, regardless of when financial reports were received at the New York office. It will be seen that the figures differ from those given in the Treasurer's statement on pages 281 to 355. The Treasurer's Report includes amounts paid in the field during the first three quarters of 1918, to which in many instances have been added amounts paid during the fourth quarter of 1917, but not recorded until early in 1918. This discrepancy between the two reports is caused by the necessity of closing the Treasurer's books shortly after the first of the calendar year, before detailed financial reports can be received from the foreign countries in which a large part of the work of the Board is conducted.

TABLE 9: *Expenditures of International Health Board During the Year 1918*

FIELDS OF ACTIVITY	AMOUNT EXPENDED
Grand Total	\$1,121,585.11
RELIEF AND CONTROL OF HOOKWORM DISEASE..	455,810.75
MALARIA CONTROL.....	26,489.29
YELLOW FEVER CONTROL.....	46,639.17
TUBERCULOSIS IN FRANCE.....	433,030.43
PUBLIC HEALTH EDUCATION.....	36,642.82
PHILIPPINE HOSPITAL SHIP.....	12,500.00
INVESTIGATION OF SEWAGE DISPOSAL AT RURAL HOMES.....	4,288.01
FIELD STAFF SALARIES, EXPENSES, AUTOMOBILES, ETC., NOT PRORATED TO SPECIFIC BUDGETS...	5,143.32
MISCELLANEOUS.....	27,596.64
ADMINISTRATION.....	73,444.68
ITEMIZATION BY STATES AND COUNTRIES	
RELIEF AND CONTROL OF HOOKWORM DISEASE..	455,810.75
Southern States.....	89,501.36
West Indies.....	57,800.06
Central America.....	113,545.86
South America.....	97,031.00
The East.....	97,932.47
Southern States.....	<u>\$89,501.36</u>
Administration.....	8,749.79
Alabama.....	5,922.09
Arkansas.....	2,784.41
Georgia.....	5,418.95
Kentucky.....	2,064.97
Louisiana.....	1,317.93
Maryland.....	2,494.53
Mississippi.....	9,427.52
North Carolina.....	15,775.89
South Carolina.....	13,592.37
Tennessee.....	6,642.20
Texas.....	9,362.85
Virginia.....	5,947.86
West Indies.....	<u>57,800.06</u>
Administration.....	4,298.24
British Guiana*.....	16,504.11
Dutch Guiana*.....	4,389.11
Grenada.....	1,833.74
Jamaica—Survey.....	3,937.85
St. Lucia.....	8,152.28
St. Vincent.....	6,383.25
Trinidad.....	12,301.48

* For administrative reasons, British and Dutch Guiana, although on the mainland of South America, are considered West Indian Colonies.

TABLE 9: *Expenditures of International Health Board
During the Year 1918—Continued*

FIELDS OF ACTIVITY	AMOUNT EXPENDED
RELIEF AND CONTROL OF HOOKWORM DISEASE— <i>Continued</i>	
Central America.....	\$113,545.86
Administration.....	7,058.73
Costa Rica.....	21,330.40
Guatemala.....	20,816.27
Nicaragua.....	22,454.30
Panama.....	24,312.26
Salvador.....	17,573.90
South America—Brazil.....	97,031.00
The East.....	97,932.47
Administration.....	4,145.61
Ceylon.....	36,041.44
China.....	12,400.87
Fiji.....	5,579.84
Papua.....	2,009.41
Queensland.....	16,624.09
Seychelles Islands.....	8,089.06
Siam.....	13,042.15
MALARIA CONTROL.....	\$26,489.29
Arkansas.....	4,749.02
Mississippi.....	21,740.27
YELLOW FEVER CONTROL.....	46,639.17
East Coast of Brazil and Southern Littoral of the Caribbean.....	2,897.97
Ecuador—Investigation.....	22,878.02
Ecuador—Control.....	6,595.96
Guatemala—Control.....	14,267.22
TUBERCULOSIS IN FRANCE.....	433,030.43
Central Administration.....	80,037.65
Medical Division.....	267,237.59
Educational Division.....	85,755.19
PUBLIC HEALTH EDUCATION.....	36,642.82
Department of Hygiene—Faculdade de Medi- cina e Cirurgia de Sao Paulo:	
Equipment.....	\$13,085.46
Operating Expenses.....	17,578.31
Fellowships.....	2,125.07
Bello Horizonte Medical School—Fellowship	32,788.84
Advisor in Medical Education.....	2,353.98
	1,500.00

TABLE 9 : *Expenditures of International Health Board
During the Year 1918—Continued*

FIELDS OF ACTIVITY	AMOUNT EXPENDED
MISCELLANEOUS.....	\$27,596.64
Drugs for Conserving Health of Field Staff...	202.50
Field Equipment and Supplies.....	3,000.00
Surveys and Exhibits.....	14,970.85
Pamphlets and Charts.....	3,999.49
Lecture Charts.....	17.40
Conference of Health Officers of the Southern States.....	2,990.76
Portable House for Salvador.....	945.35
Express, Freight and Exchange.....	1,063.83
Dr. A. M. Struse—Personal Loss from Earth- quake.....	406.46

211

CHINA MEDICAL BOARD

Report of the General Director

To the President of the Rockefeller Foundation:
Sir:—

I have the honor to submit herewith my report as General Director of the China Medical Board for the period January 1, 1918, to December 31, 1918.

Respectfully yours,
WALLACE BUTTRICK,
General Director.

CHINA MEDICAL BOARD

OFFICERS AND MEMBERS 1918

Chairman

GEORGE E. VINCENT

General Director

WALLACE BUTTRICK

Resident Director in China

ROGER S. GREENE

Secretary

EDWIN R. EMBREE

Members

*Wallace Buttrick	John R. Mott
*Simon Flexner	*Starr J. Murphy
Frederick L. Gates	Francis W. Peabody
Frank J. Goodnow	John D. Rockefeller, Jr.
Roger S. Greene	*Wickliffe Rose
Harry Pratt Judson	*George E. Vincent
William H. Welch	

* Member of Executive Committee.

CHINA MEDICAL BOARD

OFFICERS AND MEMBERS 1919

Chairman and General Director

GEORGE E. VINCENT

Resident Director in China

ROGER S. GREENE

Secretary

EDWIN R. EMBREE

Members

*Wallace Buttrick	John R. Mott
*Simon Flexner	*Starr J. Murphy
Frederick L. Gates	Francis W. Peabody
Frank J. Goodnow	John D. Rockefeller, Jr.
Roger S. Greene	*Wickliffe Rose
Harry Pratt Judson	*George E. Vincent
William H. Welch	

* Member of Executive Committee.

TRUSTEES OF THE PEKING UNION MEDICAL COLLEGE

OFFICERS, MEMBERS, AND EXECUTIVE COMMITTEE

1918

Chairman

JOHN R. MOTT

Vice-Chairman

JAMES L. BARTON

Secretary

WALLACE BUTTRICK

Executive Committee

Arthur J. Brown	George E. Vincent, <i>Chairman</i>
Wallace Buttrick	Simon Flexner
	Frank Mason North

Members

To Serve Until the Annual Meeting of 1921

J. Auriol Armitage	Simon Flexner
James L. Barton	Robert H. Kirk
	John R. Mott

To Serve Until the Annual Meeting of 1920

Arthur J. Brown	James Christie Reid
Wallace Buttrick	George E. Vincent

To Serve Until the Annual Meeting of 1919

F. H. Hawkins	Wickliffe Rose
Frank Mason North	William H. Welch

These members have been elected as follows:

By the Rockefeller Foundation

Wallace Buttrick	John R. Mott
Simon Flexner	Wickliffe Rose
Robert H. Kirk	George E. Vincent
	William H. Welch

By the London Missionary Society

F. H. Hawkins

By the Medical Missionary Association of London

James Christie Reid

By the American Board of Commissioners for Foreign Missions

James L. Barton

By the Society for the Propagation of the Gospel in Foreign Parts

J. Auriol Armitage

By the Board of Foreign Missions of the Methodist Episcopal Church

Frank Mason North

*By the Board of Foreign Missions of the Presbyterian Church in the
United States of America*

Arthur J. Brown

TRUSTEES OF THE PEKING UNION MEDICAL COLLEGE

OFFICERS, MEMBERS, AND EXECUTIVE COMMITTEE

1919

Chairman

JOHN R. MOTT

Vice-Chairman

ARTHUR J. BROWN

Secretary

EDWIN R. EMBREE

Executive Committee

George E. Vincent, *Chairman*

Arthur J. Brown
Wallace Buttrick

Simon Flexner
Frank Mason North

Members

To Serve Until the Annual Meeting of 1922

F. H. Hawkins
Paul Monroe

Frank Mason North
William H. Welch

To Serve Until the Annual Meeting of 1921

J. Auriol Armitage
James L. Barton

Simon Flexner
Robert H. Kirk

John R. Mott

To Serve Until the Annual Meeting of 1920

Arthur J. Brown
Wallace Buttrick

James Christie Reid
George E. Vincent

These members have been elected as follows:

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Simon Flexner
Robert H. Kirk

John R. Mott
Paul Monroe
George E. Vincent

William H. Welch

By the London Missionary Society

F. H. Hawkins

By the Medical Missionary Association of London

James Christie Reid

By the American Board of Commissioners for Foreign Missions

James L. Barton

By the Society for the Propagation of the Gospel in Foreign Parts

J. Auriol Armitage

By the Board of Foreign Missions of the Methodist Episcopal Church

Frank Mason North

*By the Board of Foreign Missions of the Presbyterian Church in the
United States of America*

Arthur J. Brown

TRUSTEES OF
THE SHANGHAI MEDICAL SCHOOL
OF THE
ROCKEFELLER FOUNDATION

OFFICERS AND MEMBERS

1918

Chairman

GEORGE E. VINCENT

Vice-Chairman

JOHN W. WOOD

Secretary

WALLACE BUTTRICK

Executive Committee

George E. Vincent, *Chairman*

Wallace Buttrick
Simon Flexner

Starr J. Murphy
Robert E. Speer

Members

To Serve Until the Annual Meeting of 1921

Robert E. Speer
George E. Vincent

William H. Welch
John W. Wood

To Serve Until the Annual Meeting of 1920

Simon Flexner
Frederick L. Gates

Starr J. Murphy
Francis W. Peabody

To Serve Until the Annual Meeting of 1919

Fletcher S. Brockman

Wallace Buttrick
Walter B. Cannon

TRUSTEES OF
THE SHANGHAI MEDICAL SCHOOL
OF THE
ROCKEFELLER FOUNDATION

OFFICERS AND MEMBERS
1919

Chairman

GEORGE E. VINCENT

Vice-Chairman

JOHN W. WOOD

Secretary

EDWIN R. EMBREE

Executive Committee

George E. Vincent, *Chairman*

Fletcher S. Brockman
Wallace Buttrick

Simon Flexner
Robert E. Speer

Members

To Serve Until the Annual Meeting of 1922

Fletcher S. Brockman

Wallace Buttrick

Walter B. Cannon

To Serve Until the Annual Meeting of 1921

Robert E. Speer
George E. Vincent

William H. Welch
John W. Wood

To Serve Until the Annual Meeting of 1920

Simon Flexner
Frederick L. Gates

Starr J. Murphy
Francis W. Peabody

CHINA MEDICAL BOARD

During the year, construction work on the buildings of the Peking Union Medical College went forward. The total number of members of the faculty proper was increased to thirty-four, and a large number of other persons were appointed to less important positions in connection with the school. Contributions were paid to nineteen hospitals, three medical schools, and sixty-five fellows and scholars.

I. THE PEKING UNION MEDICAL COLLEGE

The attention of the China Medical Board during the past year has been centered on the construction of the Peking Union Medical College and the securing of a competent faculty.

Many obstacles have been encountered in the construction work, including export and transportation embargoes, high cost of materials during war-time, and the very unfavorable rate of exchange. Through the mediation of Minister Reinsch, the building materials were exempted from taxation. The construction work which has proceeded throughout the year has involved more expense than was originally expected. The present estimate on the land, the completed buildings, and the equipment calls for about five million dollars.

At the request of the Board, Mr. Robert H. Kirk, Comptroller of the Rockefeller Foundation, went to Peking during the summer to study and report on the building operations there. He and Mr. Greene, acting under the authorization of the Board, drew up new contracts with Mr. Harry H. Hussey, who was to act thereafter as



Fig. 53.—Peking Union Medical College. Now in Course of Construction

architect only. Mr. B. Frank Bennett, formerly superintendent of construction, is now in full charge of the building operations, on salary from the Board, and Mr. Charles E. Lane, of the architectural firm of Murphy and Dana, has been engaged as adviser.

Progress has been made towards securing a faculty, although Dr. McLean, the Director, has been serving with the U. S. Army and has therefore been unable to give as much attention as he wished to this work. During the earlier part of the year Dr. McLean was in Washington and was able to go to Baltimore or New York occasionally for conference; during the latter part he was in France.

OFFICERS OF ADMINISTRATION AND INSTRUCTION

The faculty members and administrative officers, including certain appointments made since the close of 1918 (indicated by footnote) are as follows:

THE MEDICAL SCHOOL

Franklin C. McLean, Ph.D., M.D., Director, professor, and head of the department of medicine. Age 31. University of Chicago, B.S., 1907, M.S., 1912, Ph.D., 1915. Rush Medical College, M.D., 1910. Assistant Resident Physician, Hospital of the Rockefeller Institute, 1914-1916.

- Henry Spencer Houghton, Ph.B., M.D.*, Acting Director. Age 39. Ohio State University, Ph.B. Johns Hopkins Medical School, M.D. Formerly Dean and Professor of Tropical Medicine, Harvard Medical School of China.
- Edmund V. Cowdry, Ph.D.*, Professor and head of the department of anatomy. Age 31. University of Toronto, B.A., 1909. University of Chicago, Ph.D., 1912. Associate in anatomy, Johns Hopkins University, 1913-1917.
- Harvey James Howard, M.D., D.Oph.*, Professor and head of the department of ophthalmology. Age 39. University of Michigan, B.A., 1904. University of Pennsylvania, M.D., 1908. Formerly in charge of the eye, ear, and nose department, Canton Christian College.
- *J. Preston Maxwell, M.D.*, Professor and head of the department of obstetrics and gynecology. Age 48. London University, B.S., M.B., 1898, M.D., 1910. Formerly in charge of Yungchun Hospital, Fukien.
- Ralph Garfield Mills, M.D.*, Professor and head of the department of pathology. Age 38. University of Illinois, B.A., 1903. Northwestern Medical College, M.D., 1907. Director of department of research, Severance Union Medical College, Seoul, Korea.
- Adrian Stevenson Taylor, M.D.*, Professor and head of the department of surgery. Age 36. Universities of Alabama and Virginia. University of Virginia, M.D., 1905. In charge of the hospital of the Southern Baptist Convention at Yangchow, China.

* Appointed since December 31, 1918.



Fig. 54.—A unit of the Peking Union Medical College. One of the fifteen buildings being erected by the China Medical Board



Fig. 55.—Construction staff at work on a building of the Peking Union Medical College

Davidson Black, B.A., M.B., Professor of embryology and neurology. University of Toronto, M.D., 1906, B.A., 1911. Assistant professor of anatomy, Western Reserve Medical School. Canadian Army Medical Corps.

† *Ernest G. Grey, M.D.*, Professor of surgery. Graduate, University of Wisconsin. Johns Hopkins Medical School, M.D., 1911.

Albert Menzo Dunlap, B.A., M.D., Associate professor of otology, rhinology, and laryngology. Age 35. University of Illinois, B.A., 1906. Harvard Medical School, M.D. Professor of otology, rhinology, and laryngology, and chief of outpatient department, Harvard Medical School of China.

Bernard E. Read, Ph.C., M.S., Associate professor of physiological chemistry. Age 31. Yale, M.S., 1918. Connected with the Union Medical College, Peking, 1909-1916.

* *Oswald H. Robertson, M.S., M.D.*, Associate professor of medicine. Age 33. University of California, B.S., 1910, M.S., 1911. Harvard Medical School, M.D., 1915. Assistant in pathology and bacteriology, Rockefeller Institute for Medical Research.

* *Andrew H. Woods, M.D.*, Associate professor of neurology and psychiatry. Age 47. Washington and Lee University, B.A., 1893. University of Pennsylvania, M.D., 1899. Canton Hospital, 1900-1907. University of Pennsylvania, assistant neurologist, 1908-1911. Canton Christian College, acting president, 1912-1916. Major in Army Medical Corps, 1918-1919.

* Appointed since December 31, 1918.

† Died October 11, 1918.

Frederick E. Dilley, M.D., Associate in surgery. Age 42. Western Reserve University. Acting head of department of surgery in the Union Medical College and hospital, and superintendent of hospital.

**Miss Hartley C. Embrey, M.S.*, Associate in physiological chemistry, with particular attention to food chemistry. Age 32. University of Nashville, B.A., 1907, University of Chicago, M.S., 1915. Two years' graduate study at Sorbonne, Paris. Head of department of science, Central High School, Chattanooga, Tennessee, 1917-1918. Experimental work with DuPont Company, 1918-1919.

**Ernest C. Faust, Ph.D.*, Associate in parasitology. Age 29. Oberlin College, B.A., 1912. University of Illinois, M.A., 1914, Ph.D., 1917. Instructor in zoology, University of Illinois, 1917-1919.

**Paul C. Hodges, M.D.*, Associate in roentgenology. Age 26. Collegiate work at University of Wisconsin. Washington University School of Medicine, M.D., 1918. Photomicroscopist to department of surgery, Washington University School of Medicine.

John H. Korns, M.D., Associate in medicine. Age 35. Ohio Wesleyan University, B.A., 1904. Rush Medical College, M.D., 1909. Taianfu Men's Hospital, Taianfu, Shantung, 1911-1915. Appointed to Union Medical College faculty, 1915.

William G. Lennox, B.A., M.D., Associate in medicine. Colorado College, B.A. Harvard Medical School, M.D. Instructor in medicine and assistant physician, Union Medical College, Peking (old School).

Tsing-meu Li, M.D., Associate in ophthalmology. Age 35. Oahu College, Honolulu, H. I. St. John's

* Appointed since December 31, 1918.

University, Shanghai, graduated from School of Medicine. University of Pennsylvania, M.D., 1909. On staff of University of Pennsylvania Medical School at Canton, 1909-1913, and on staff Hunan-Yale Hospital, 1913-1914.

H. Jocelyn Smyly, M.A., M.D., F.R.C.S., I., Associate in medicine. Age 36. Trinity College of Dublin University, undergraduate and medical work. Appointed to Union Medical College faculty under former management in 1913.

Edgar T. H. Tsen, M.D., Associate in bacteriology. Age 25. Boone University, Wuchang, and Harvard Medical School of China. Postgraduate work at Harvard Medical School, Boston, and College of Physicians and Surgeons of Columbia University.

Charles W. Young, B.S., M.D., Associate in medicine. Age 44. University of Illinois, B.S., 1897. Johns Hopkins Medical School, M.D., 1903. Connected with the Union Medical College under former management from 1906, for several years as Dean.

**En-tseng Hsieh, M.D., D.P.H.*, Assistant in anatomy. Age 35. Graduated Union Medical College, Peking, 1911. Harvard Medical School, D.P.H., 1917. Postgraduate work, University of Pennsylvania Medical School.

**Jui-hua Liu, M.D.*, Assistant in otology, rhinology, and laryngology. Age 27. Anglo-Chinese College, Tientsin. Pei-yang Medical College, Tientsin, M.D., 1915. Postgraduate work at Harvard Medical School, 1917-1918. Service Red Cross Hospital, Shanghai, 1915-1917. Special interne New York Eye and Ear Infirmary, 1918-1919.

* Appointed since December 31, 1918.

Way Sung New, M.D., Assistant in surgery. Age 26. Harvard Medical School, M.D., 1914. In charge of department of anatomy, Harvard Medical School of China, 1915-1916.

Laurence M. Sears, Assistant in Modern European Languages. Princeton College, B.A., 1917. Teaching in several schools and giving part time to Peking Union Medical College.

**Robert Spencer Stone*, Assistant in anatomy. Age 24. Completing seven-year course in biology and physiology, University of Toronto, June, 1919, including first two years of medical course. Seventeen months' army service.

S. Y. Wong, M.S., Assistant in physiological chemistry. Age 26. University of Chicago, B.S., 1916, M.S., 1917. Research work in drying oils.

**Arthur Waitah Woo, M.R.C.S., L.R.C.P.*, Assistant in obstetrics and gynecology. Age 30. University College, London, M.R.C.S., L.R.C.P., 1913. Formerly senior house surgeon and resident medical officer, East Suffolk and Ipswich Hospital. Obstetric and gynecological house surgeon, Middlesex Hospital, England.

C. M. Yü, Assistant in Chinese.

Y. T. Ch'ü, M.D., Resident Surgeon.

**Richard H. P. Sia, M.D.*, Assistant resident physician. Age 24. Boone University, Wuchang, China, B.S. Western Reserve University, M.D., 1918. House and admitting officer, Cleveland City Hospital.

C. H. Chang, M.D., Clinical assistant in surgery.

K. M. Ma, Hsiu-ts'ai, Instructor in Chinese. Formerly

* Appointed since December 31, 1918.

taught in preparatory department of Government University at Peking.

Adolf Eduard Zucker, M.A., Ph.D., Instructor in English and German. Age 29. University of Illinois, B.A., 1912, M.A., 1913. University of Pennsylvania, Ph.D., 1917. Formerly teacher of French and German, Tsing Hua College, Peking.

Donald E. Baxter, M.D., Superintendent. Age 37. Hiram College. University of Louisville, M.D. Wide engineering and administrative experience. Director of New York Committee on After Care of Infantile Paralysis Cases. Worked under Red Cross in France on organization of hospitals.

Philip Allen Swartz, B.A., B.D., Director of Religious Work. Age 30. Lafayette College, B.A., 1910. Union Theological Seminary. Ordained by Presbytery of Newark, 1917. Formerly Pastor of Church of Forest Hills, Long Island (union, undenominational).

A. J. D. Britland, M.P.S., Pharmacist.

George G. Wilson, Secretary and Treasurer (on leave). Mr. Wilson was on the staff of the former Union Medical College, and has been for several years on leave in war service.

A. J. Skinn, M.P.S., Acting Treasurer.

Emily Gilfillan, B.A., Librarian. Age 27. University of Michigan, B.A., 1914. Two and a half years assistant librarian of the Rockefeller Foundation.

**Miss E. Grace McCullough*, Dietitian. Age 50. Studied at Washington School of Cookery and Southern

* Appointed since December 31, 1918.

Homeopathic Medical College. Dietitian, Massachusetts General Hospital, Boston, 1907-1911. Dietitian, Peter Bent Brigham Hospital, Boston, 1912-1919. In 1913 investigated and reported on von Noorden Clinic, Vienna, Austria.

H. C. Mao, Bookkeeper

Miss Harriet Barchet, B.A., Secretary to the Director.

Miss J. Dorothy Gordon, B.A., Secretary and technician.

Internes, 1918-1919.

Liu Ju-kang	Li Pao-an
Pi Hua-te	Yuan Te-mao
Pa Ta-chih	Kung Hsien-wu
Pai Tzu-ming	Wang Chun-ling

THE PRE-MEDICAL SCHOOL

William Warren Stifler, Ph.D., Dean and instructor in physics. Age 35. Shurtleff College, B.A., 1902. University of Illinois, M.A., 1908, Ph.D., 1911. Instructor in physics at Columbia University, 1911-1916.

K. M. Ma, Hsiu-ts'ai, Instructor in Chinese. Formerly taught in preparatory department of Government University at Peking.

Charles W. Packard, Ph.D., Instructor in biology. Age 33. Syracuse University, B.S., 1907, M.S., 1908. Columbia University, Ph.D., 1914. Instructor in biology at Columbia University, 1914-1918.

**Bird R. Stephenson, M.S.*, Instructor in physics. Age 29. Albion College, Michigan, B.A., 1914. University of Illinois, M.S., 1917. Assistant in physics, University of Illinois, 1917-1918.

* Appointed since December 31, 1918.

Stanley D. Wilson, Ph.D., Instructor in chemistry. Age 36. Wesleyan University, B.A., 1909, M.A., 1910. University of Chicago, Ph.D., 1916. Instructor in organic chemistry, Rice Institute, Houston, Texas, 1916-1917.

Adolf Eduard Zucker, M.A., Ph.D., Instructor in English and German. Age 29. University of Illinois, B.A., 1912, M.A., 1913. University of Pennsylvania, Ph.D., 1917. Formerly teacher of French and German, Tsing Hua College, Peking.

Miss Alice Middleton Boring, Ph.D., Assistant in biology. Age 36. Bryn Mawr, B.A., 1904, M.A., 1905, Ph.D., 1910. University of Pennsylvania, fellow in zoology, 1905-1906. Wurzburg and Stazione Zoologica, Naples, 1908-1909. Associate professor of biology, University of Maine, 1913-1918.

C. T. Feng, Assistant in chemistry. Assistant in chemistry at the Union Medical College, 1915-1916. Post-graduate course in chemistry at Weihsien, 1916-1917.

Ming-hai Ma, M.A., Assistant in Physics.

**Miss Alice Ryder*, Assistant in English. Employed on the field with approval of Trustees.

Laurence M. Sears, Assistant in Modern European Languages. Princeton College, B.A., 1917. Teaching in several schools and giving part time to Peking Union Medical College.

C. M. Yü, Assistant in Chinese.

Mrs. I. K. Loeber, Secretary to the Dean.

P. L. Shih, Secretary to the Dean of the Pre-Medical School.

*Appointed since December 31, 1918.

THE TRAINING SCHOOL FOR NURSES

**Miss Anna Dryden Wolf, M.A., R.N.*, Superintendent of Nurses. Age 29. Goucher College, B.A., 1911. Teachers College, Columbia University, M.A., 1916. Assistant Superintendent of the Johns Hopkins Hospital Training School since 1916.

Miss Edith J. Haward, Acting Superintendent of Nurses. Ipswich Nursing Home, one year. Guy's Hospital, London, five years. Appointed to Peking, 1913.

**Miss Mary Louise Beaty, B.S.*, Age 42. Graduate, Presbyterian Hospital, Philadelphia, 1904. Teachers College, Columbia University, B.S., 1916. Presbyterian Hospital, San Juan, Porto Rico, head nurse, 1907-1910; Superintendent of Nurses, 1910-1917. Instructor in Army School of Nursing since 1918.

**Miss Florence Bridgman Brown*, Age 25. Graduate New Britain Normal School and Johns Hopkins Hospital, 1918.

Miss Jo Carr, graduate of Touro Infirmary, New Orleans.

**Miss Kathleen Caulfield*, Age 26. Graduate, Bishop Bethune College, Canada, and Johns Hopkins Hospital, 1918.

Miss Susan H. Connelly.

**Miss Florence Kelly Goodman*, Age 28. Graduate Johns Hopkins Hospital, 1915. Head nurse, Johns Hopkins Convalescent Home.

Miss Ruth Ingram.

**Miss Mary McCoy*, Age 41. Graduate, St. Luke's Training School, Chicago, 1899. Chief nurse, dis-

* Appointed since December 31, 1918.

pensary Indiana University School of Medicine.
Army service one year. Private nursing five years.

**Mrs. Sophia Packer*, Age 28. Graduate, Johns Hopkins Hospital, 1918.

Pai Hsiu-lan, Graduate, West Philadelphia Hospital for Women. Postgraduate work, Presbyterian Hospital, New York. Henry Street Settlement, New York, one year.

**Miss Martha Schaur*, Age 25. Graduate, Johns Hopkins Hospital, 1917.

Miss Joan Swann.

**Miss Lula Sweet*, Formerly in charge of nursing at the Red Cross General Hospital, Shanghai. Postgraduate work at Johns Hopkins Hospital, 1918-1919.

A number of the members of the faculty have spent the year in the United States in further graduate study and research, preparatory to taking up their duties at Peking when the buildings are completed and the school is opened for students.

An announcement of the work of the Peking School has been printed and sent to four or five thousand persons interested in medical education in China.

For the sake of the members of the staff who, on coming to China, will wish to learn the Chinese language, the Board has joined the North China Language School Union and has

* Appointed since December 31, 1918.

appointed Dr. Houghton and Dr. Stifler as its representatives on the school's board of management.

Two preparatory schools, the Peking Primary School and Kindergarten, and the North China American School at Tungchow, are receiving small sums from the Board, for it is expected that members of the faculty will send their children to these schools. They are supported by the societies whose representatives use them.

II. SHANGHAI MEDICAL SCHOOL

The very unfavorable rates of exchange, and the increased cost of building materials which resulted from the war, made the construction work at Peking so expensive that it has been thought best to postpone building activities at Shanghai pending the completion of the Peking School. A careful survey and study of the whole situation from architectural, engineering, and building standpoints, to cover one and a half or two years, has been recommended before any construction is begun. As the completion of the buildings at Peking will require at least one and a half years longer, and as the new survey probably should not be begun until the work on the Peking buildings has been finished, it seems likely that building operations in Shanghai will not be begun for at least three or four years.

A gift amounting to \$5,500 has been received from the Harvard Medical School of China, to be used toward the endowment of the Shanghai Medical School.

III. OTHER MEDICAL WORK AIDED

No new appropriations have been made for medical or pre-medical education. Payments have been continued on former appropriations to the medical schools of Yale, St. John's University, and the Shantung Christian University (Tsinanfu Union Medical College).

Fukien Christian University and St. John's University have not yet found themselves in position to make use of the grants of the China Medical Board for pre-medical work, beyond a single fellowship for a Chinese member of their scientific department which St. John's University has asked for and received.

In accordance with the Board's policy of reducing its expenditures for work other than that of the Peking Union Medical College, fewer appropriations have been made for missionary hospitals than in former years; and in general these were small additions to appropriations already made rather than new undertakings. The largest appropriation to a new hospital was that to St. James Hospital at Anking, which has been granted funds toward buildings, equipment, and salaries. The only other considerable appropriations were made for the Foreign Christian



Fig. 56.—Medical institutions aided by China Medical Board (in addition to the medical school at Peking supported in full)

Missionary Society's hospital at Luchowfu, which for the past year or two has been receiving funds for salaries from the China Medical Board, and has for a long time been under consideration for the grants which have now been made for buildings, equipment, and operating expenses.

Payments have been made to missionary societies during the year, to reimburse them for losses in exchange on their expenditures for work supported by the Board.

About \$90,000 was also spent for medical education exclusive of the Peking and Shanghai schools, and about \$100,000 for missionary hospitals. Table 10 and Fig. 57 (pp. 262 and 253) show the expenditures made by the Board from 1915 to 1918, and the pledges for future years. Fig. 56 (p. 251) gives the location of the different hospitals aided by the China Medical Board, indicating approximately the total amounts paid and pledged to the hospitals.

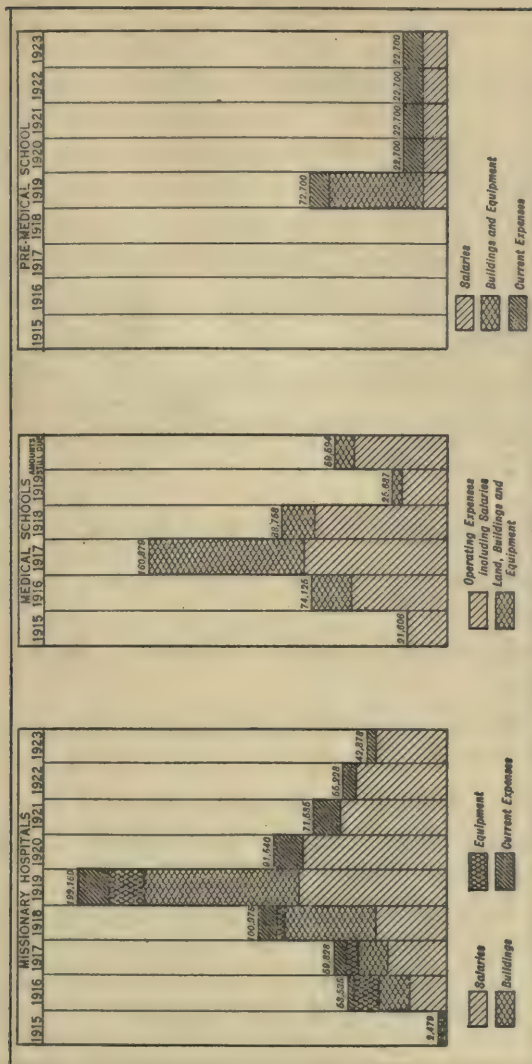


Fig. 57.—Actual expenditures through 1918 and pledges for future years, for missionary hospitals, medical, and pre-medical schools. China Medical Board

IV. FELLOWSHIPS AND SCHOLARSHIPS

Study has been carried on during the year, under fellowships and scholarships of the China Medical Board, by thirty-five medical missionaries and nurses on furlough, eleven Chinese doctors, ten undergraduate students (from the Harvard Medical School of China), six Chinese nurses, and three Chinese pharmacists.

The names of the persons studying here during the year are as follows:¹

MEDICAL MISSIONARIES ON FURLOUGH²

T. W. Ayers, M.D., Southern Baptist Hospital, Hwanghien.

H. W. Boyd, M.D., American Presbyterian Mission, Canton.

N. Worth Brown, M.D., Nanking Union Hospital, Nanking.

Grace Crandall, M.D., Liu-ho Hospital, Liu-ho.

A. M. Dunlap, M.D., Peking Union Medical College, Peking.

¹ The three pharmacists, who have been here for several years, continued their work during the early part of the year. Mr. George K. How and Mr. Charles T. Cheng then returned to China and are now working as graduate pharmacists at the Hunan-Yale Medical School and the Shantung Christian University, respectively. Mr. Y. D. Hsi went to France in the Y. M. C. A. service with the Chinese troops.

² This list includes several persons who have been appointed to, or are under consideration for, positions in the Peking or Shanghai schools of the China Medical Board.

- Helen Robertson Gage, M.D.*, Hunan-Yale Medical School,
Changsha.
- Nina D. Gage, Nurse*, Hunan-Yale Medical School,
Changsha.
- F. P. Gaunt, M.D.*, Wuhu General Hospital, Wuhu.
- F. W. Goddard, M.D.*, American Baptist Hospital,
Shaohsing.
- J. S. Grant, M.D.*, American Baptist Hospital, Ningpo.
- Paul V. Helliwell, M.D.*, Canadian Episcopal Mission,
Kweitech.
- Harvey J. Howard, M.D., D.Oph.*, Peking Union Medical
College, Peking.
- J. Charles Humphreys, M.D.*, Ningyuenfu Hospital,
Ningyuenfu.
- Mary L. James, M.D.*, Church General Hospital,
Wuchang.
- E. M. Johnstone, M.D.*, American Methodist Mission,
Peking.
- John M. Korns, M.D.*, Peking Union Medical College,
Peking.
- C. B. Leshner, M.D.*, American Baptist Hospital, Chaoyang.
- S. C. Lewis, M.D.*, American Presbyterian Hospital,
Chenchow.
- C. S. F. Lincoln, M.D.*, St. John's University, Shanghai.
- O. Houghton Love, M.D.*, Tungchow Hospital, Tungchow.
- Mabel Manderson, M.D.*, Methodist Mission, Peking.
- J. Preston Maxwell, M.D.*, Yungchun Hospital, Yung-
chun.
- W. H. Park, M.D.*, Southern Methodist Hospital,
Soochow.
- Ethel Polk, M.D.*, Southern Methodist Hospital (for
women), Soochow.

Charles A. Powell, M.D., Chaohsien General Hospital,
Chaohsien.

Bernard E. Read, M.S., Peking Union Medical College,
Peking.

Emma E. Robbins, M.D., Methodist Mission Hospital,
Chinkiang.

Florence Sayles, Nurse, Women's Methodist Hospital,
Tientsin.

Lula Sweet, Nurse, Red Cross General Hospital, Shanghai.

Adrian S. Taylor, M.D., Peking Union Medical College,
Peking.

Harry B. Taylor, M.D., St. James Hospital, Anking.

J. Oscar Thomson, M.D., Canton Hospital, Canton.

Paul J. Wakefield, M.D., Luchowfu Hospital, Luchowfu.

Andrew H. Woods, M.D., Canton Christian College,
Canton.

Charles W. Young, M.D., Peking Union Medical College,
Peking.

CHINESE GRADUATE PHYSICIANS

George Y. Char, M.D., Wuchang General Hospital,
Wuchang.

Hung Pih Chu, M.D., Red Cross General Hospital,
Shanghai.

Edward Young Kau, M.D., Red Cross General Hospital,
Shanghai.

C. C. Liau, M.D., University Hospital, University of
Pennsylvania, Philadelphia.

C. C. Liu, M.D., Union Medical College, Peking (interne).

Jui Hua Liu, M.D., Red Cross General Hospital,
Shanghai.

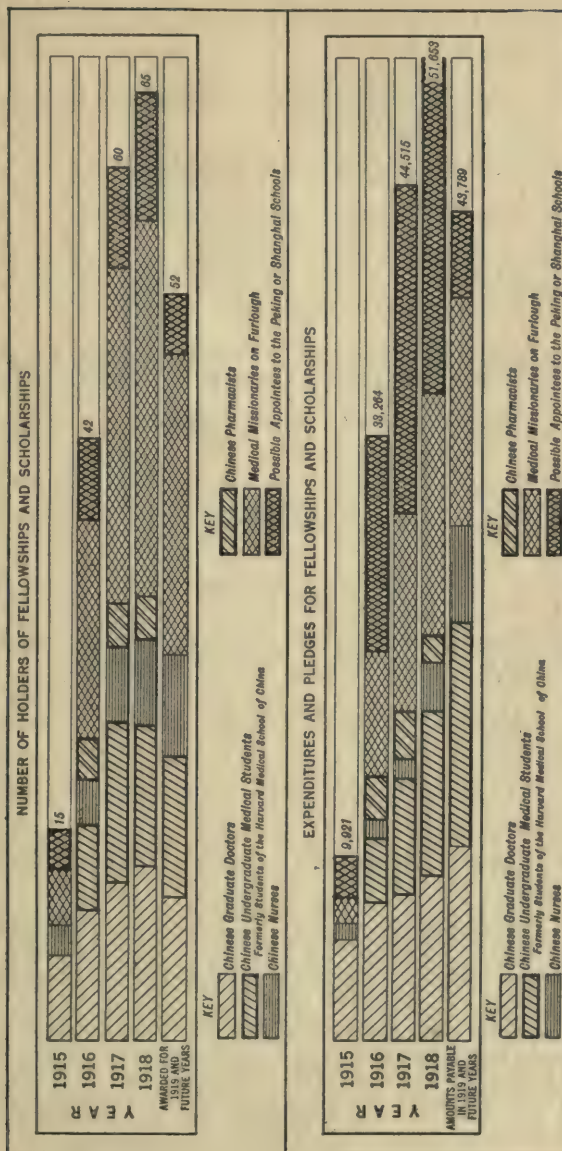


Fig. 58.—Number of scholarship and fellowship holders, by years, since creation of China Medical Board

Way Sung New, M.D., Red Cross General Hospital,
Shanghai.

Edgar T. H. Tsen, M.D., Hunan-Yale Medical School
and Hospital, Changsha.

Lan Sung Woo, M.D., St. Luke's Hospital, Shanghai.

Grace Yoh, M.D., St. James Hospital, Anking.

Zung-dau Zau, M.D., Red Cross General Hospital,
Shanghai.

UNDERGRADUATE MEDICAL STUDENTS FROM THE HARVARD MEDICAL SCHOOL OF CHINA¹

Sheo-nan Cheer

Tse King

Cheng-hsiang Hu

Wen-ping Ling

Ven-tsao Loh

Ernest Tso

Shu-tai Woo

CHINESE NURSES

Miss Mabel Mooney, Red Cross General Hospital,
Shanghai.

Miss Winifred Mooney, Red Cross General Hospital,
Shanghai.

Miss Elizabeth Sze, Southern Methodist Hospital,
Soochow.

Miss Loo Sung Woo, Johns Hopkins Nursing School,
Baltimore.

Miss Lillian Wu, Danforth Memorial Hospital, Kiukiang.

Miss Wei-li Yih, Red Cross General Hospital, Shanghai.

¹ The students from the Harvard Medical School of China who have been in this country for the past two years have continued their work toward the degree of Doctor of Medicine, Mr. Cheer at the Johns Hopkins and the others at the Harvard Medical School in Boston. Dr. A. M. Dunlap, who has himself held a fellowship of the China Medical Board, has given their work his careful supervi-

Statistics have been prepared for the several years of the Board's existence on the basis of the number of persons actually studying. Tables 11 and 12 and Fig. 58 (pp. 263 and 257) show by years the number of fellowships and scholarships that have been used, and the total payments that have been made on these accounts, together with pledges for future years.

MISCELLANEOUS

Small grants have been made for several years to the Nurses' Association of China and the Publication Committee of the China Medical Missionary Association for work in translation. These have not been intended to commit the Board to any system of translation, but merely to help along temporarily a worthy work. The appropriation this year for the Publication Committee amounted to \$5,500 and included part stipend for Dr. Cousland, who is in charge

sion. After the completion of their courses, which some of them are nearing, they will remain in the United States for an internship, and possibly for further graduate study, and then return to China for service under one of the missionary societies or this Board.

Two other men from the Harvard Medical School of China, Mr. Zau-yong Zee and Mr. Mur-sung Ting, have been studying at St. John's University in Shanghai under small grants from the China Medical Board.

Mr. Cheuk-shang Mei, another undergraduate medical student, holds a small fellowship for work at Columbia University leading towards the degrees of Doctor of Medicine and Master of Arts.

of the work, and salaries for five Chinese assistants.

Three eminent Chinese educators, Mr. Fan Yuan-lien, recently Minister of Education, Mr. Yen Hsiu, a Hanlin scholar of the old regime, and Mr. F. T. Sun, President of the School of Fisheries at Tientsin, spent several months in the United States. The Board was able to assist them in getting in touch with the leading authorities on education in this country.

OFFICERS OF THE BOARD

At the December meeting of the Board, the General Director, Dr. Wallace Buttrick, stated that owing to his many duties as President of the General Education Board, he was obliged to resign from the directorship of the China Medical Board. His resignation was accepted and Dr. George E. Vincent was appointed to succeed him. Mr. Edwin R. Embree, Secretary of the Rockefeller Foundation, is Secretary of the China Medical Board, and also of the Boards of Trustees of the Peking Union Medical College and of the Shanghai Medical School of the Rockefeller Foundation.

**Summary of Expenditures of China Medical Board
for the Year 1918.**

I. ADMINISTRATION	
Home office.....	\$20,828
Peking office.....	24,849
II. PEKING UNION MEDICAL COLLEGE	
Land, buildings and equipment.....	1,619,666
Administration.....	116,317
III. SHANGHAI MEDICAL SCHOOL	
Land, buildings and equipment.....	73,427
Administration.....	5,596
Maintenance of hospital.....	35,338
IV. CONTRIBUTIONS TO MISSIONARY HOSPITALS.....	
	123,686
V. CONTRIBUTIONS TO MISSIONARY MEDICAL SCHOOLS.....	
	57,549
VI. FELLOWSHIPS AND SCHOLARSHIPS.....	
	51,575
VII. MISCELLANEOUS.....	
	2,757
<hr/>	
TOTAL FOR THE YEAR 1918.....	\$2,131,588

TABLE 10: *Expenditures and Pledges for Missionary Hospitals, Medical, and Pre-Medical Schools By Years¹*

1. MISSIONARY HOSPITALS										
	1915	1916	1917	1918	1919	1920	1921	1922	1923	
Salaries.....	\$1,054	\$19,850	\$31,350	\$37,239	\$79,418	\$76,414	\$57,403	\$48,128	\$37,528	
Buildings.....	.....	17,000	16,000	49,125	83,350	.....	.....	.....	.....
Equipment.....	1,000	13,609	6,277	3,938	19,350	.....	.....	.....	.....
Current Expenses...	425	3,076	6,201	10,676	17,051	15,126	14,350	7,100	4,850	
TOTALS.....	\$2,479	\$53,535	\$59,828	\$100,978	\$199,169	\$91,540	\$71,753	\$55,228	\$42,378	
2. MISSIONARY MEDICAL SCHOOLS										
	1915	1916	1917	1918	1919	1920	1921	1922	1923	TOTALS
Operating Expenses, including										
Salaries.....	\$21,606	\$51,950	\$77,551	\$70,758	\$20,450			\$49,594	\$291,909	
Land, buildings and equipment	.....	22,175	83,328	18,000	5,237			10,000	138,740	
TOTALS.....	\$21,606	\$74,125	\$160,879	\$88,758	\$25,687			\$59,594	\$430,649	
3. MISSIONARY PRE-MEDICAL SCHOOLS										
	1919	1920	1921	1922	1923	TOTALS				
Salaries.....	\$12,700	\$12,700	\$12,700	\$12,700	\$12,700	\$63,500				
Buildings and equipment.....	50,000	.....	.....	.....	.....	50,000				
Current Expenses.....	10,000	10,000	10,000	10,000	10,000	50,000				
TOTALS.....	\$72,700	\$22,700	\$22,700	\$22,700	\$22,700	\$163,500				

¹These figures are compiled from the standpoint of the amounts paid to the missionary societies for use during the designated years. An exact statement of the amount paid during the year, for use either then or at some other time, will be found in the Treasurer's Report, pp. 314-334.

Board, By Years

	FELLOWSHIPS ON WHICH PAYMENTS HAVE BEEN MADE				FELLOWSHIPS AWARDED FOR 1919 AND FUTURE YEARS		TOTAL NUMBER OF INDIVIDUALS
	1915	1916	1917	1918	1919	FUTURE YEARS	
Chinese graduate doctors.....	6	9	11	11	10		20
Chinese undergraduate medical students (formerly students of the Harvard Medical School of China).....	—	6	11	10	10		13
Chinese nurses.....	2	3	5	6	7		9
Chinese pharmacists.....	—	3	3	3	—		3
Medical missionaries on furlough.....	4	15	23	26	21		55
Possible appointees to the Peking or Shanghai Schools.....	3	6	7	9	4		10
TOTAL INDIVIDUALS PER YEAR	15	42	60	65	52		110

TABLE 12: Expenditures and Pledges for Fellowships and Scholarships Since Creation of China Medical Board, By Years¹

	PAYMENTS			1918	AMOUNTS PAYABLE IN 1919 AND FUTURE YEARS		TOTALS
	1915	1916	1917		1919	FUTURE YEARS	
Chinese graduate doctors.....	\$5,486	\$7,283	\$7,526	\$8,756	\$10,105		\$39,156
Chinese undergraduate medical stu- dents (formerly students of the Har- vard Medical School of China).....	—	3,627	6,263	8,651	11,943		30,484
Chinese nurses.....	950	950	750	2,659	5,268		10,577
Chinese pharmacists.....	—	2,301	2,754	1,800	—		6,855
Medical missionaries on furlough.....	1,235	7,428	10,211	12,575	11,725		43,174
Possible appointees to the Peking or Shanghai Schools.....	2,250	11,675	17,011	17,212	4,748		52,896
TOTAL.....	\$9,921	33,264	44,515	51,653	43,789		183,142

¹ See footnote, page 262.

2151
THE ROCKEFELLER INSTITUTE
FOR MEDICAL RESEARCH

SPECIAL WAR ACTIVITIES

Report of the Director of Laboratories

To the President of the Rockefeller Foundation:
Sir:—

I have the honor to submit herewith my report of the special war activities of the Rockefeller Institute for Medical Research, which have been supported by the Rockefeller Foundation for the period January 1, 1918, to December 31, 1918.

Respectfully yours,

SIMON FLEXNER,
Director of Laboratories.

WAR WORK OF THE ROCKEFELLER INSTITUTE FOR MEDICAL RESEARCH

During 1918 the Rockefeller Foundation continued its special appropriations to the Rockefeller Institute for the support of war activities outside the precise scope of the normal work of the Institute, which is to promote medical discovery through research. Upon the entrance of the United States into the war, the Institute adjusted its activities to a war basis and equipped its several laboratories so that they would supplement the various research laboratories at the command of Government. In scientific research looking toward the prevention and the curative treatment of disease, it had already made contributions which offered immediate application to the medical problems likely to arise in connection with the greatly enlarged personnel of the Army and Navy: among these were the curative serums which it had developed for epidemic meningitis and for one of the forms of pneumonia—diseases which have always appeared with great force in large military organizations,—and the method of treating infected surgical wounds which Doctors Carrel and Dakin had perfected and which had come to have wide

applicability in practice. Inasmuch as it was evident that other medical and allied problems would call for investigation, the entire resources of the Institute were placed freely at the disposal of the Surgeons General and other government officials.

INSTRUCTION AT WAR DEMONSTRATION HOSPITAL

In order to carry out on a large scale the teaching of the Carrel-Dakin treatment for infected wounds, the Rockefeller Foundation built on the grounds of the Institute a portable military base hospital. Completed in the summer of 1917, the hospital continued in active operation throughout 1918. Instruction was given during the year to medical officers and enlisted men of the United States Army and Navy, to civilian surgeons, and to nurses of the Red Cross and of civil hospitals. The total number of persons receiving instruction during the year was 998.

The staff consists of surgeons assigned by the Surgeon General of the United States Army, of French military surgeons lent by the French Sanitary Service, and of bacteriologists and chemists in part assigned by the Surgeon General of the United States Army. Most of the instruction has been given to the men in classes conducted in the laboratories, in the wards, and in the operating room, and by lectures with lan-

tern slides and moving pictures. Class work has been arranged in the following manner:

Surgical Course: Two weeks' instruction in the treatment of infected wounds. Twenty-seven courses given.

Chemistry Course: Organized April 1, 1918. Three days' instruction in the chemistry of antiseptics. Six courses given.

Laboratory Course: Course organized July 1, 1918. One week's instruction in laboratory methods used in conjunction with wound treatment. Three courses given.

Special Instruction: At various times special instruction has been given to individual medical officers, doctors, nurses, and enlisted men. Special demonstrations have also been arranged or groups of doctors, nurses, etc., and for medical officers under instruction elsewhere in New York or from base hospitals.

A detailed report of the number of persons receiving instruction is as follows:

Surgical Class:

Medical Officers of the Army	503
Medical Officers of the Navy	78
Civilians	40
	<hr/>
Total	621

Chemistry Class:

Medical Officers and Enlisted Men of the Army.....	129
Medical Officers and Enlisted Men of the Navy.....	2
Civilians.....	3
	<hr/>
Total.....	134

Laboratory Class:

Medical Officers and Enlisted Men of the Army.....	78
	<hr/>
Total Number Receiving Instruction in Classes..	833

Special Instruction:

Medical Officers of the Army.....	30
Medical Officers of the Navy.....	10
Enlisted Men of the Army.....	25
Enlisted Men of the Navy.....	35
Female Nurses.....	15
Civilians.....	50
	<hr/>
Total.....	165
TOTAL RECEIVING INSTRUCTION.....	998

Special Demonstrations Given:

Groups of Surgeons of Base Hospitals.....	10
Surgical Classes Attending Other Schools of Instruction in New York.....	9
Groups of Nurses of Base Hospitals.....	25
	<hr/>
Total.....	44

*Lectures and Demonstrations Given by Members of the Staff
at Various Institutions and Before Various Medical
Societies:*

Lt. George Loewy	35
Capt. Geo. Dehelly	10
Major Geo. Stewart	15
Capt. Glenn Cullen	5
Capt. T. F. Sullivan	2
Lt. A. H. Ebeling	4
<hr/>	
TOTAL	71

TREATMENT AT WAR DEMONSTRATION HOSPITAL

During the year, 237 patients received treatment in the hospital. On August 31 the first returned soldier was admitted to the hospital. Since that time most of the patients admitted have been men returned from France. Volunteer reconstruction aides have been working in the wards since August 1.

With the going into effect of the armistice, the work of the War Demonstration Hospital did not cease. In the first place, the patients still under treatment required care until they were ready to be transferred to other hospitals or to be returned to their commands. Next, the Surgeon General requested the courses of instruction to be continued for another period of three months in order that regular army surgeons who had not

attended the classes might receive the benefit of the training. The Foundation made a special appropriation of \$55,000 to enable the hospital to continue in active operation until April 1, 1919.

COURSES IN BACTERIOLOGY, ETC.

The classes in bacteriology, chemistry, and technical instruction were continued throughout the year except for a break during the height of the influenza epidemic in October and November.

	Number Attended
Bacteriological Class.....	364
Chemical Class.....	133
Technical Class.....	45
	—
TOTAL.....	542

The instruction in these several subjects ceased with the signing of the armistice, except that the classes under way were carried to the completion of the courses.

PRODUCTION OF SERUM

The preparation of serums by the Institute, and the distribution of these to Government hospitals, have constituted another Foundation-supported contribution to the war. At the time

of the signing of the armistice, the serum production for the treatment of meningitis, pneumonia, and dysentery was at its height. The number of doses supplied increased from 3,000 in 1917 to 25,000 in 1918. It is estimated that the output for the first three months of 1919 will far exceed the entire output for 1918.

The following summary shows the amounts of different kinds of serums which were distributed during 1918:

<i>Meningitis Serum:</i>	Liters
Army Medical School, Washington.....	290.20
Army Camps.....	54.22
Naval Medical School, Washington.....	2.00
Naval Stations and Camps.....	16.48
American Expeditionary Force, Units Going Abroad.....	6.48
Rockefeller Institute Hospital, for Army..	1.32
Hygienic Laboratory, U. S. Public Health Service, Health Departments.....	1.00
Royal Naval College, London.....	32.00
Capt. Hussey, England.....	1.00
	<hr/>
	404.70
For diagnostic purposes, Army and Navy	2.18
	<hr/>
TOTAL.....	406.88

This serum is put up in bottles of 20 mils

each. Hence the number of bottles of the serum issued equals 2,035.

The serum was obtained from twenty-seven horses under immunization for this purpose at the Department of Animal Pathology at Princeton, N. J.

Antipneumococcus Serum:

		(Liters)	
	Army	Navy	Total
Type I.....	38.93	3.05	41.98
Type II.....	13.59	2.01	15.60
Type III.....	5.21	2.00	7.21
	<hr/>	<hr/>	<hr/>
TOTAL.....	57.73	7.06	64.79

In addition to the above amounts, twenty-eight liters of antipneumococcus serum were used for instruction purposes in the sixteen bacteriological courses, making a total of 92.79 liters of antipneumococcus serum supplied in 1918.

Of the 41.98 liters of Type I serum supplied, 27.9 liters were for therapeutic use and the remaining 14.08 liters for diagnostic purposes.

The above serum was obtained from seventeen horses under immunization for this purpose at the Department of Animal Pathology at Princeton, N. J.

Antidysenteric Serum:

	Liters
Army Medical School, Washington.....	10.00
Army Camps.....	.24
American Expeditionary Force, Units Going Abroad.....	25.00
American Red Cross, France.....	20.00
U. S. Persian Expedition.....	.48
	<hr/>
	55.72
For Diagnostic Purposes, Army and Navy .	.28
	<hr/>
TOTAL.....	56.00

This serum is put up in bottles of twenty mls each. Hence the number of bottles of the serum issued equals 280.

The above serum was obtained from two horses under immunization for this purpose at the Department of Animal Pathology at Princeton, N. J.

Attention is directed to the fact that in the case of the serums for pneumonia a distinction is drawn between what is called "therapeutic" and "diagnostic" uses. While several kinds of serums can be produced for the purpose of determining the particular or specific type of pneumococcus causing given cases of pneumonia, only one kind of serum, namely that directed against so-called *Pneumococcus* Type I, is practically effective in the treatment of the

disease. Hence it becomes necessary in every case of pneumonia to determine promptly the type of pneumococcus responsible for the disease. This is done by means of the diagnostic serum. If the pneumococcus discovered is a Type I organism, then the Type I serum should be administered; otherwise not, as it has no effect on cases of pneumonia caused by other types of pneumococcus, of which several are known.

ANTIGASEOUS GANGRENE SERUM

At the time of the cessation of hostilities the control of gaseous gangrene appeared near at hand. The investigation carried out at the Institute on that subject, under the appropriation from the Foundation for war research, opened the way for the production of an anti-serum not only for the gas bacillus (*B. welchii*) but also for other anaerobic bacteria occurring in cultivated soils, which often accompanied the gas bacillus in wounds and intensified its destructive action. Experiments to enlarge the therapeutic properties of the antigaseous gangrene serum so as to include the other bacterial species mentioned are so well advanced that it is safe to conclude that a permanent addition has been made to the measures now available for preventing gaseous gangrene, or for curing it when

it arises in connection with the industrial and other accidents of civil life.

TREATMENT OF SYPHILIS

The new drug which has been prepared for the treatment of syphilis has been administered in the Hospital of the Rockefeller Institute to 126 patients belonging to the armed forces of the nation,—seventy-nine from the Army and forty-seven from the Navy. As one result of the precise tests thus carried out, the drug has been issued to a small number of general hospitals in which syphilis is treated. It is hoped soon to collate all the records based on the cases treated with the drug in different institutions, so as to arrive at a decision as to the limitations of its usefulness, if there are any such limitations, and also as to the best manner of its administration. Until this is done, the drug will not be offered for general employment.

CONTINUATION OF WAR-TIME MEDICAL INVESTIGATIONS

The investigations which were taken up under war circumstances can in many instances be continued with advantage and applied to the conditions arising in times of peace. The close of hostilities has permitted the laboratory erected at St. Cloud to be discontinued, and Doctor

Carrel and his staff are now in New York, where, under far more favorable physical conditions, they can continue the investigations upon which they were at work. In the Hospital of the Rockefeller Institute the researches on streptococci, taken up during the epidemics of pneumonia following measles and influenza in the Army camps, will be carried to a conclusion because of their intrinsic importance and the menace which streptococcic infections present in civil life.

231

THE ROCKEFELLER FOUNDATION

Report of the Treasurer

To the President of the Rockefeller Foundation:
Sir:—

I have the honor to submit herewith my report of the financial operations of The Rockefeller Foundation and its subsidiary organizations for the period January 1, 1918, to December 31, 1918.

Respectfully yours,

L. G. MYERS,
Treasurer.

TREASURER'S REPORT

Income available for appropriation during the year was as follows:

Income from principal funds (not including special funds) and from invested income and reserve.....	\$7,609,710.68
Gifts from Mr. John D. Rockefeller..	1,000,000.00
	<hr/>
Total.....	<u>\$8,609,710.68</u>

The undisbursed balance carried over from 1917, after adding sundry refunds, was \$11,630,164.68. This, added to income as above, made a total of \$20,239,875.36 available for disbursement. Of this sum \$15,050,202.16 was disbursed, leaving a balance of \$5,189,673.20, applicable to the following uses:

Amount due on appropriations made in 1918 and prior years, not yet called for.....	\$2,138,524.33
Amount available for appropriation— not taking into account pledges due in 1919, referred to below	3,051,148.87
	<hr/>
Total.....	<u>\$5,189,673.20</u>

The pledges that become effective in 1919 amount to \$7,934,641.70. This sum is considered a charge against income for 1919. If treated as a present liability it follows that income as of December 31, 1918, is exceeded by appropriations to the extent of \$4,883,492.83.

Additional appropriations which become effective in 1920 and subsequent years, amounting to \$2,271,395.00, are considered as charges against the income for the years in which they become payable.

The \$1,000,000.00 given by Mr. Rockefeller, mentioned above, was in payment of his pledges of \$500,000.00 each toward the Foundation's contributions to the American Red Cross and United War Work Campaign.

On January 30, 1918, the Harvard Medical School of China transferred to the Foundation, under a trust agreement, the sum of \$25,000, which is to be known as the Henry Sturgis Grew Memorial Fund.

On July 23, 1918, the Harvard Medical School of China gave to the Foundation the sum of \$5,500. This gift is to be known as the Arthur Theodore Lyman Endowment, and the income applied to the uses of the Shanghai Medical School.

There have been no other changes in principal funds during the year, excepting a gain in the reserve fund amounting to \$42,123.47, as shown in Exhibit P.

Land, buildings and equipment acquired during the year, by the expenditure of income, cost \$1,704,059.74, as shown in Exhibit O. The amount carried in this account as an asset is thus increased from last year's figure of \$809,612.80 to \$2,513,672.54.

The financial condition and operations are set forth in the appended exhibits listed below:

Balance Sheet.....	Exhibit A
Statements of Receipts and Disburse- ments of Income.....	Exhibit B
Foundation's Appropriations:	
War Work.....	Exhibit C

After Care of Infantile Paralysis Cases	Exhibit D
Mental Hygiene.....	Exhibit E
Rockefeller Institute and Medical Education.....	Exhibit F
School of Hygiene and Public Health	Exhibit G
Miscellaneous.....	Exhibit H
International Health Board Appropriations.....	Exhibit I
China Medical Board Appropriations...	Exhibit J
Summary of Appropriations and Payments.....	Exhibit K
Additional Appropriations for Future Years.....	Exhibit L
Appropriations and Payments of Special Funds.....	Exhibit M
Statements of Principal Funds.....	Exhibit N
Land, Buildings and Equipment Funds.	Exhibit O
Transactions Relating to Invested Funds	Exhibit P
Schedule of Securities in General Funds.	Exhibit Q
Schedule of Securities in Special Funds .	Exhibit R

EXHIBIT A

BALANCE SHEET, DECEMBER 31, 1918

ASSETS

I. INVESTMENTS

General Schedule (Exhibit Q) ..	\$125,994,175.94	
Less amount of income investments (see below)	3,817,550.62	
		<u>\$122,176,625.32</u>
Special Funds (Exhibit R)		111,300.00
		<u>\$122,287,925.32</u>
Special Fund cash on deposit awaiting investment (Exhibit N)		5,500.00
		<u>\$122,293,425.32</u>

II. LAND, BUILDINGS AND EQUIPMENT (Exhibit O)

\$2,513,672.54

III. INCOME ACCOUNTS

Income invested temporarily (Exhibit B)		\$3,817,550.62
Funds in the hands of agents, to be accounted for, and sundry accounts receivable	\$1,262,380.83	
Less accounts payable	111,678.09	
		<u>1,150,702.74</u>
Cash on deposit		261,294.69
		<u>\$5,229,548.05</u>

GRAND TOTAL

\$130,036,645.91

EXHIBIT A

BALANCE SHEET, DECEMBER 31, 1918

FUNDS AND OBLIGATIONS

I. FUNDS

General Fund (Exhibit N)	\$120,765,856.00	
Estate Laura S. Rockefeller Fund (Exhibit N)	152,733.00	
Reserve Fund (Exhibit N)	1,258,036.32	
	<hr/>	\$122,176,625.32
Special Funds (Exhibit N)		
Gift of John D. Rockefeller . .	\$37,000.00	
Gift of Laura S. Rockefeller . .	49,300.00	
Henry Sturgis Grew Memo- rial Fund	25,000.00	
Shanghai Medical School Fund	5,500.00	
	<hr/>	116,800.00
		<hr/>
		\$122,293,425.32
		<hr/>
		<hr/>

II. LAND, BUILDINGS AND EQUIP-
MENT FUND

Appropriations from income (Exhibit O)		\$2,513,672.54
		<hr/>
		<hr/>

III. INCOME ACCOUNTS

Estate of Laura S. Rockefeller Fund Income (Exhibit B) . . .		\$39,022.36
Henry Sturgis Grew Memorial Fund Income (Exhibit B) . . .		787.08
Shanghai Medical School Fund Income (Exhibit B)		65.41
Balance payable on appropria- tions (Exhibit K)	\$2,138,524.33	
*Unappropriated income	3,051,148.87	
	<hr/>	5,189,673.20
		<hr/>
		\$5,229,548.05
		<hr/>
		<hr/>

GRAND TOTAL		\$130,036,645.91
		<hr/>
		<hr/>

*It should be noted that these figures do not take into account appropriations and pledges payable in 1919 amounting to \$7,934,641.70. If allowance be made for this sum, it follows that appropriations will exceed funds in hand by \$4,883,-492.83. Nor are additional appropriations and pledges, amounting to \$2,271,-395.00, which become effective in 1920 and subsequent years, included in the balance sheet. Both of these liabilities are, for the purposes of this report, considered as charges against the income for the years in which they become payable.

EXHIBIT B

STATEMENT OF RECEIPTS AND DISBURSEMENTS OF INCOME
AND OF OTHER FUNDS AVAILABLE FOR APPROPRIATION

GENERAL FUNDS

RECEIPTS

Balance, January 1, 1918	\$11,629,048.11	
China Medical Board refunds:		
Peking Union Medical College		
property	\$859.02	
Fellowship and Scholarships	257.55	
		1,116.57
		<hr/>
Income from principal funds and		\$11,630,164.68
funds temporarily invested	\$7,609,710.68	
Gifts from Mr. John D. Rockefeller	1,000,000.00	
		<hr/>
		8,609,710.68
Total amount available		\$20,239,875.36

DISBURSEMENTS

INTERNATIONAL HEALTH BOARD

(Exhibit I):

Hookworm, Malaria and Yellow	
Fever work	\$514,503.87
Tuberculosis work in France	447,573.69
Medical Education	18,880.75
Miscellaneous	108,335.61
	<hr/>
	\$1,089,293.92

CHINA MEDICAL BOARD (Exhibit J):

Missionary Societies—Hospitals .	\$123,685.98
Fellowships and Scholarships	51,575.39
Medical Schools:	
Unaffiliated	57,549.10
Affiliated	1,850,342.73
Miscellaneous	48,435.08
	<hr/>
	2,131,588.28

WAR WORK (Exhibit C):

Well being of Soldiers, Sailors and	
Prisoners-of-war	\$6,202,734.44
Medical work	349,557.86
Humanitarian work	4,552,933.88
	<hr/>
	11,105,226.18

Carried forward	\$14,326,108.38	\$20,239,875.36
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EXHIBIT B—*Continued*STATEMENT OF RECEIPTS AND DISBURSEMENTS OF INCOME AND
OF OTHER FUNDS AVAILABLE FOR APPROPRIATION

GENERAL FUNDS

<i>Brought forward</i>	\$14,326,108.38	\$20,239,875.36
AFTER CARE OF INFANTILE PARALY-		
SIS CASES (Exhibit D)	38,956.95	
MENTAL HYGIENE (Exhibit E)	17,050.00	
ROCKEFELLER INSTITUTE AND MED-		
ICAL EDUCATION (Exhibit F)	288,277.84	
SCHOOL OF HYGIENE AND PUBLIC		
HEALTH (Exhibit G)	91,959.97	
MISCELLANEOUS (Exhibit H)	150,135.96	
ADMINISTRATION (Exhibit H)	137,713.06	
	<u>\$15,050,202.16</u>	

BALANCE:

Securities (Exhibit Q)	\$3,817,550.62	
Cash on deposit	221,419.84	
Funds in the hands of agents, to		
be accounted for, and sundry		
accounts receivable	1,262,380.83	
	<u>\$5,301,351.29</u>	
Less accounts payable	111,678.09	
	<u>5,189,673.20</u>	
	<u>\$20,239,875.36</u>	<u>\$20,239,875.36</u>

BALANCE AS ABOVE IS APPORTIONED AS FOLLOWS:

Payable on appropriations and pledges for 1918 and previous		
years	\$2,138,524.33	
Amount available for appropriation	3,051,148.87	
	<u>\$5,189,673.20</u>	

EXHIBIT B—(Continued)

STATEMENT OF RECEIPTS AND DISBURSEMENTS OF
INCOME AND OF OTHER FUNDS AVAILABLE
FOR APPROPRIATION

SPECIAL FUNDS

LAURA S. ROCKEFELLER FUNDS INCOME

Income collected during the year	\$3,000.00
Amounts paid to the several societies designated by Mrs. Rockefeller (Exhibit M) . . .	<u>\$3,000.00</u>

JOHN D. ROCKEFELLER FUND INCOME

Income collected during the year	\$1,850.00
Amounts paid to the society designated by Mr. Rockefeller (Exhibit M)	<u>\$1,850.00</u>

ESTATE LAURA S. ROCKEFELLER FUND INCOME

Balance, January 1, 1918	\$28,039.07
Income collected during the year	<u>10,983.29</u>
Balance accounted for in cash on deposit	<u>\$39,022.36</u>

JOINT ACCOUNT BELGIAN CHILDREN IN SWITZERLAND

Balance, January 1, 1918	\$1,847.28
Credits adjusting account	562.68
Interest, July 18, 1916 to November 1, 1918 credited to account	<u>1,918.71</u>
Total paid to American Red Cross	<u>\$4,328.67</u>

HENRY STURGIS GREW MEMORIAL FUND

Income collected during the year	\$787.08
Accounted for in cash on deposit	<u>\$787.08</u>

ARTHUR THEODORE LYMAN ENDOWMENT

Bank interest from date of receipt of fund, July 23, 1918, to December 31, 1918	\$65.41
Accounted for in cash on deposit	<u>\$65.41</u>

EXHIBIT C

1918 FOUNDATION APPROPRIATIONS,

UNPAID BALANCES OF APPROPRIATIONS MADE IN PREVIOUS YEARS,
AND PAYMENTS THEREON MADE IN 1918

WAR WORK

	PRIOR APPROPRIA- TIONS	1918 APPROPRIA- TIONS	1918 PAYMENTS
WELL-BEING OF SOLDIERS, SAILORS, AND PRISONERS- OF-WAR			
American Social Hy- giene Association, (R.F. 2256) For the support of workers serving under the direction of the Commission on Training Camp Ac- tivities	\$2,623.29	.....	\$2,623.29
(R.F. 2307) For its work during the period January 1st to June 30th, 1918.	.....	\$100,000.00	99,467.14
(R.F. 2330) For dem- onstration of Social Hygiene program in War Camp Com- munity .....	.....	25,000.00	.....
(R.F. 2345) Law En- forcement and So- cial Hygiene bud- gets of Commission	.....	50,000.00	50,000.00
(R.F. 2353) Law En- forcement and So- cial Hygiene .....	.....	110,000.00	18,025.09
Knights of Columbus (R.F. 2304, 2326) For war work during 1918 .....	.....	200,000.00	200,000.00
Playground and Recrea- tion Association of America (R.F. 2266) For ad- ministrative ex- penses of its work in the American Army Training Camps	75,000.00	.....	75,000.00
<i>Carried Forward</i>	<i>\$77,623.29</i>	<i>\$485,000.00</i>	<i>\$445,115.52</i>

EXHIBIT C—*Continued*

	PRIOR APPROPRIA- TIONS	1918 APPROPRIA- TIONS	1918 PAYMENTS
<i>Brought Forward . . .</i>	\$77,623.29	\$485,000.00	\$445,115.52
WELL-BEING OF SOLDIERS, SAILORS, AND PRISON- ERS-OF-WAR (<i>Cont'd</i>)			
Playground and Recrea- tion Association of America (<i>Cont'd</i>)			
(R.F. 2342) Loaned for the promotion of War Camp Com- munity with the understanding that so much as may have been called for will be repaid to the Treasury of the Rockefeller Foun- dation on or before November 30, 1918	.....	900,000.00	.....
Training Camp Auxili- ary Fund Commit- tee			
(R.F. 2306) For its work for the period from January 1st to June 30, 1918 ..	.....	50,000.00	38,893.05
Teaching of Hygiene to United States Troops			
(R.F. 2346) For dem- onstration at Camp Meade .....	.....	1,500.00	1,000.00
United War Work Fund			
(R.F. 2352) For war work of the seven co-operating agen- cies .....	.....	2,500,000.00	2,500,000.00
(R.F. 2354) Special dividend declared by the National Lead Company...	.....	14,700.00	14,700.00
War Camp Community Service			
(R.F. 2332) For a demonstration dur- ing 1918 in adequate care of negro troops	.....	25,000.00	25,000.00
<i>Carried Forward . . .</i>	\$77,623.29	\$3,976,200.00	\$3,024,708.57

EXHIBIT C—Continued

	PRIOR APPROPRIA- TIONS	1918 APPROPRIA- TIONS	1918 PAYMENTS
<i>Brought Forward . . .</i>	\$77,623.29	\$3,976,200.00	\$3,024,708.57
WELL-BEING OF SOLDIERS, SAILORS AND PRISONERS- OF-WAR (Cont'd)			
Young Men's Christian Association, International Com- mittee (R.F. 2232) For work in prisoners-of-war and training camps abroad	75,000.00	.....	75,000.00
National War Work Council, Y. M. C. A. (R.F. 2305) Toward its general budget for the period Janu- ary 1st to June 30, 1918 . . . . .	.....	2,500,000.00	2,500,000.00
Young Women's Chris- tian Association, War Work Council (R.F. 2270) For work in connection with the American Army training camps . . .	253,025.87	.....	253,025.87
(R.F. 2335) For its war work in Am- erica during the period from July 1, 1917 to July 1, 1918 . . . . .	.....	350,000.00	350,000.00
MEDICAL WORK			
National Committee for Mental Hygiene (R.F. 2234) To pro- vide buildings for a Naval Psychiatric Unit	15,000.00	.....	.....
(R.F. 2289) For work in connection with the American Army and Navy during the year 1918 . . . .	.....	25,000.00	25,000.00
<i>Carried Forward . . .</i>	\$420,649.16	\$6,851,200.00	\$6,227,734.44

EXHIBIT C—*Continued*

	PRIOR APPROPRIA- TIONS	1918 APPROPRIA- TIONS	1918 PAYMENTS
<i>Brought Forward . . .</i>	\$420,649.16	\$6,851,200.00	\$6,227,734.44
MEDICAL WORK (<i>Cont'd</i>)			
National Research Council			
(R.F. 2319) For the support of its Division of Medicine and Related Sciences during the period March 1st to December 31, 1918 . .	.....	50,000.00	13,856.82
Rockefeller Institute for Medical Research			
(R.F. 2246) For support of hospital under control of Dr. Carrel for teaching military and other surgeons new methods of surgical treatment of infected wounds . . .	100,000.00	.....	100,000.00
(R.F. 2317) For the operation of its War Demonstration Hospital during the year 1918 . . . . .	.....	125,000.00	75,000.00
(R.F. 2230) For additional equipment for teaching military and naval surgeons	10,000.00	.....	7,364.03
(R.F. 2302, 2338) For instruction of military and naval surgeons during the year 1918 . . . . .	.....	15,000.00	15,000.00
(R.F. 2228, 2318) For war research and relief during the year 1917	25,000.00	7,403.52	31,853.52
(R.F. 2300, 2327) For war research and relief during the year 1918 . . . . .	.....	35,000.00	26,104.44
<i>Carried Forward . . .</i>	\$555,649.16	\$7,083,603.52	\$6,496,913.25

EXHIBIT C—Continued

	PRIOR APPROPRIA- TIONS	1918 APPROPRIA- TIONS	1918 PAYMENTS
<i>Brought Forward</i>	\$555,649.16	\$7,083,603.52	\$6,496,913.25
MEDICAL WORK (Cont'd)			
Rockefeller Institute for Medical Research (Cont'd)			
(R.F. 2229, 2313) For additional equip- ment, assistance and materials at the Princeton Farm for the preparation of serums during the year 1917	25,000.00	4,877.41	29,877.41
(R.F. 2301) For the preparation of ser- ums at the Prince- ton Farm during the year 1918 . . . . .	.....	25,000.00	25,000.00
(R.F. 2343) For the maintenance of spe- cial war activities to December 31, 1918 . . . . .	.....	33,202.00	501.64
HUMANITARIAN WORK			
American Red Cross			
(R.F. 2247) For the war fund of the American Red Cross	*1,500,000.00	.....	1,500,000.00
(R.F. 2336) For the maintenance and care of the Belgian children in Switzer- land during the period from July 1, 1917 to December 31, 1918 . . . . .	.....	75,000.00	22,196.33
(R.F. 2340) Special dividend declared by the National Lead Company . . . . .	.....	29,400.00	29,400.00
(R.F. 2337) For the second war fund of the American Red Cross . . . . .	.....	3,000,000.00	3,000,000.00
<i>Carried Forward</i>	\$2,080,649.16	\$10,251,082.93	\$11,103,888.63

* A portion of the principal fund of the Foundation was made available for this appropriation.

EXHIBIT C—*Continued*

	PRIOR APPROPRIA- TIONS	1918 APPROPRIA- TIONS	1918 PAYMENTS
<i>Brought Forward</i> . . .	\$2,080,649.16	\$10,251,082.93	\$11,103,888.63
HUMANITARIAN WORK (<i>Cont'd</i>)			
Belgium (R.F. 2192) Stipends for Belgian profes- sors in England . . .	2,517.57	.....	2,500.00
Poland, Serbia, Monte- negro and Albania (R.F. 2165) For re- lief work	103,218.63	.....	.....
General Relief Work (R.F. 2157) To be expended at the dis- cretion of the Di- rector of the War Relief Commission	15,419.26	.....	.....
Dr. Vincent's Trip to Europe (R.F. 2286) For sal- aries and expenses .	.....	18,000.00	1,395.00
War Relief Commission (R.F. 2216) Admin- istration—1917 . . .	19,567.07	.....	.....
TOTALS	\$2,221,371.69	\$10,269,082.93	\$11,107,783.63
Credit adjusting R.F. 2216—War Relief Commission Ad- ministration . . . . .	.....	.....	2,557.45
Unexpended balances of appropriations al- lowed to lapse			
R.F. 2157 . . \$15,419.26			
2192 . . 17.57			
2165 . . 103,218.63			
2216 . . 18,789.95			
	137,445.41	.....	.....
R.F. 2286 . . \$16,605.00			
2307 . . 532.86			
2317 . . 47,835.62			
2327 . . 4,276.41			
2342 . . 900,000.00			
2343 . . 17,129.49			
	.....	986,379.38	.....
NET TOTALS	\$2,083,926.28	\$9,282,703.55	\$11,105,226.18

EXHIBIT D

AFTER CARE OF INFANTILE PARALYSIS CASES

	PRIOR APPROPRIA- TIONS	1918 APPROPRIA- TIONS	1918 PAYMENTS
After Care of Infantile Paralysis Cases (R.F. 2253, 2334) For administrative expenses....	\$10,463.78	\$16,000.00	\$23,517.81
State Charities Aid Association (R.F. 2290) For work during the year 1918 in cooperation with the New York State Department of Health in providing for the after care of infantile paralysis cases.....	.....	15,000.00	10,939.14
(R.F. 2314) For the conduct of clinics by Dr. Robert W. Lovett during the years 1916 and 1917.....	.....	4,500.00	4,500.00
(R.F. 2315) For the conduct of clinics by Dr. Robert W. Lovett during the year 1918.....	.....	2,000.00	.....
TOTALS.....	<u>\$10,463.78</u>	<u>\$37,500.00</u>	<u>\$38,956.95</u>

EXHIBIT E
MENTAL HYGIENE

	PRIOR APPROPRIA- TIONS	1918 APPROPRIA- TIONS	1918 PAYMENTS
National Committee for Men- tal Hygiene			
(R.F. 2259) For the work of the committee in aiding state commissions on pro- vision for the mentally defective during the year ending July 31, 1918.....	\$8,500.00	.....	.....
(R.F. 2309) For the work of the committee in aiding state commissions on pro- vision for the mentally de- fective during the year 1918.....	.....	\$11,750.00	.....
(R.F. 2260, 2311) For stud- ies in the psycho-patholo- gy of crime.....	6,000.00	7,500.00	\$2,000.00
(R.F. 2277) For adminis- tration expenses.....	.....	7,000.00	7,000.00
(R.F. 2308) For carrying out its surveys of the care and treatment of mental diseases during the year 1918.....	.....	10,000.00	1,000.00
(R.F. 2310) For the sup- port of the Psychiatric Clinic at Sing Sing Prison during the year 1918.....	.....	5,000.00	2,500.00
(R.F. 2312) For the com- mittee's work during 1918 in the establishment of uniform statistics on men- tal diseases.....	.....	2,750.00	2,750.00
(R.F. 2344) For the pur- pose of enabling a sub- committee of the New York State Commission of Prisons to make an inquiry and report looking to the adoption of the psychiatric examination of prisoners.	.....	1,800.00	1,800.00
TOTALS.....	<u>\$14,500.00</u>	<u>\$45,800.00</u>	<u>\$17,050.00</u>

EXHIBIT F

ROCKEFELLER INSTITUTE AND MEDICAL EDUCATION

	PRIOR APPROPRIA- TIONS	1918 APPROPRIA- TIONS	1918 PAYMENTS
Rockefeller Institute for Med- ical Research			
(R.F. 2173) For alteration of buildings.....	\$80,303.72	.....	\$80,303.72
(R.F. 2245) For the con- struction of coal pockets..	30,000.00	.....	26,475.06
(R.F. 2303) For buildings and equipment .....	.....	\$24,000.00	24,000.00
(R.F. 2350) To cover defi- cit of the Institute .....	.....	33,925.14	33,925.14
(R.F. 2299) For its corpor- ate purposes.....	50,000.00	.....	40,094.50
(R.F. 2347) Special fund of the Director.....	.....	7,500.00	7,500.00
(R.F. 2385) Additional Compensation to Em- ployees.....	.....	85,000.00	53,000.00
University of Chicago			
(R.F. 2287) For interest on pledge of \$1,000,000.00 for the establishment of a Medical School.....	.....	25,000.00	22,979.42
TOTALS.....	\$160,303.72	\$175,425.14	\$288,277.84
Unexpended balance of appro- priations allowed to lapse			
(R.F. 2245) \$3,524.94			
(R.F. 2299) 9,905.50			
	13,430.44		
NET TOTALS.....	\$146,873.28	\$175,425.14	\$288,277.84

EXHIBIT G

SCHOOL OF HYGIENE AND PUBLIC HEALTH

	PRIOR APPROPRIA- TIONS	1918 APPROPRIA- TIONS	1918 PAYMENTS
Johns Hopkins University			
(R.F. 2170) For the estab- lishment and maintenance of a school of hygiene and public health.....	\$228,180.30	.....	\$10,967.80
(R.F. 2242) For the ad- ministration and equip- ment during the year 1917- 1918.....	50,290.00	.....	40,838.70
(R.F. 2284) For operating expenses during the period July 1st to December 31, 1918.....	.....	\$57,017.00	13,462.02
(R.F. 2281) For renovation of physics laboratory ....	.....	18,000.00	14,952.22
(R.F. 2283) For additional apparatus for the physics laboratory.....	.....	23,600.00	243.00
(R.F. 2282) For furniture..	.....	12,000.00	11,496.23
TOTALS.....	<u>\$278,470.30</u>	<u>\$110,617.00</u>	<u>\$91,959.97</u>

EXHIBIT H
MISCELLANEOUS

	PRIOR APPROPRIA- TIONS	1918 APPROPRIA- TIONS	1918 PAYMENTS
American Academy in Rome (R.F. 215) For general pur- poses, \$10,000.00 per year for ten years beginning with 1914. (Installment due 1918).....	.....	\$10,000.00	\$10,000.00
Bureau of Municipal Research (R.F. 265) For construc- tive studies in Govern- ment of State of New York \$10,000.00 per year for five years beginning with 1915. (Installment due 1918).....	.....	10,000.00	10,000.00
(R.F. 2102) For its New York City work. \$15,000.- 00 per year for four years beginning with 1916. (In- stallment due 1918).....	.....	15,000.00	15,000.00
Committee on Scientific Re- search in Governmental Problems (R.F. 2183) For cost of publication of scientific studies.....	\$8,000.00	.....	8,000.00
Committee of Reference and Counsel of the Annual Foreign Mission Confer- ence of North America (R.F. 228) For carrying out its program of co-op- eration and co-ordination in foreign missionary work of the principal American Mission Boards. Total pledge of \$425,000.00 ex- tending over a period of ten years beginning with 1914. (Installment due 1918).....	.....	50,000.00	50,000.00
Investigation of Industrial Re- lations (R.F. 2206) Administration 1917.....	6,131.02	.....	.....
(R.F. 2276) Administration 1918.....	.....	3,333.00	2,439.60
<i>Carried Forward</i>	\$14,131.02	\$88,333.00	\$95,439.60

EXHIBIT H—*Continued*

	PRIOR APPROPRIA- TIONS	1918 APPROPRIA- TIONS	1918 PAYMENTS
<i>Brought Forward</i>	\$14,131.02	\$88,333.00	\$95,439.60
National Committee for the Prevention of Blindness (R.F. 233) \$5,000.00 per year for five years begin- ning with 1914. (Install- ment due 1918).....	.....	5,000.00	5,000.00
National Organization for Pub- lic Health Nursing (R.F. 2288) Toward the budget of the organization for the year 1918.....	.....	15,000.00	15,000.00
New York Association for Im- proving the Condition of the Poor (R.F. 239) For the purpose of providing pensions for dependent widows with families. \$20,000.00 per year for ten years begin- ning with 1914. (Balance of installment due 1917)..	15,000.00	.....	15,000.00
(Installment due 1918) ....	.....	20,000.00	5,000.00
Public Health Committee of the New York Academy of Medicine (R.F. 2333) For a study of New York City dispen- saries.....	.....	10,000.00	3,729.16
ASSET ACCOUNTS			
(R.F. 2275) Books for the Library.....	.....	700.00	218.90
(R.F. 2274, 2341) Furni- ture and Fixtures.....	.....	3,000.00	2,876.59
(R.F. 2252, 2285) Grand Chenier Tract, Taxes and Expenses.....	1,380.48	3,000.00	4,031.71
(R.F. 2351) Purchase of land.....	.....	3,840.00	3,840.00
<i>Totals Carried Forward</i>	\$30,511.50	\$148,873.00	\$150,135.96

EXHIBIT H—Continued

	PRIOR APPROPRIA- TIONS	1918 APPROPRIA- TIONS	1918 PAYMENTS
<i>Totals Brought Forward</i>	\$30,511.50	\$148,873.00	\$150,135.96
Unexpended balances of appro- priations allowed to lapse .			
(R.F. 2206)	6,131.02	.....	.....
(R.F. 2275)	\$481.10		
(R.F. 2276)	893.40		
(R.F. 2285)	348.77		
(R.F. 2341)	123.41		
	.....	1,846.68	.....
NET TOTALS	<u>\$24,380.48</u>	<u>\$147,026.32</u>	<u>\$150,135.96</u>

ADMINISTRATION

(R.F. 2272, 2291A, 2384, 2387) Executive Offices .	\$5,312.38	\$123,067.07	\$119,547.53
(R.F. 2273, 2291A, 2316, 2339, 2384) Treasurer's Office	857.52	17,823.96	18,165.53
TOTALS	<u>\$6,169.90</u>	<u>\$140,891.03</u>	<u>\$137,713.06</u>
Unexpended balances of appro- priations allowed to lapse			
(R.F. 2291A)	509.69	.....	.....
(R.F. 2339)	\$515.95		
(R.F. 2387)	2,311.89		
	.....	2,827.84	.....
NET TOTALS	<u>\$5,660.21</u>	<u>\$138,063.19</u>	<u>\$137,713.06</u>

EXHIBIT I

1918 INTERNATIONAL HEALTH BOARD¹
APPROPRIATIONS,UNPAID BALANCES OF APPROPRIATIONS MADE IN PREVIOUS YEARS,
AND PAYMENTS THEREON MADE IN 1918

	PRIOR APPROPRIA- TIONS	1918 APPROPRIA- TIONS	1918 PAYMENTS
HOOKWORM WORK			
Southern States			
Alabama			
1917—I.H. 2252 ..	\$1,070.99	.....	\$1,070.99
1918—I.H. 2319, 2320, 2321 .....	.....	\$6,500.00	4,621.53
Arkansas			
1917—I.H. 2275, 2287	781.86	.....	781.86
1918—I.H. 2322, 2427 .....	.....	2,900.00	675.50
Georgia			
1917—I.H. 2307, 2308	1,650.00	.....	189.94
1918—I.H. 2323, 2324, 2325, 2325 .....	.....	10,700.00	1,473.87
Kentucky			
1917—I.H. 2271 ..	417.65	.....	417.65
1918—I.H. 2327 ..	.....	3,300.00	.....
Louisiana			
1917—I.H. 2186 ..	1,618.36	.....	397.02
1918—I.H. 2328- 2330 .....	.....	7,200.00	842.06
Maryland			
1917—I.H. 2305 ..	495.40	.....	55.75
1918—I.H. 2331 ..	.....	2,400.00	.....
Mississippi			
1917—I.H. 2228- 2230	3,199.23	.....	2,972.62
1918—I.H. 2332- 2338 .....	.....	14,500.00	920.30
North Carolina			
1917—I.H. 2288- 2292, 2297-2300, 2317, 2413	4,992.50	.....	4,992.50
1918—I.H. 2339- 2348, 2407-2409, 2420-2422 .....	.....	13,215.88	7,533.58
Carried Forward	\$14,225.99	\$60,715.88	\$26,947.17

¹The Foundation provides for the cost of work carried on by the International Health Board by making to the Board one or more appropriations to cover its work for the year. From these large grants the Board then makes its own appropriations for specific objects.

EXHIBIT I—*Continued*

	PRIOR APPROPRIA- TIONS	1918 APPROPRIA- TIONS	1918 PAYMENTS
<i>Brought Forward</i>	\$14,225.99	\$60,715.88	\$26,947.17
HOOKWORM WORK (Cont'd)			
Southern States (Cont'd)			
South Carolina			
1917—I.H. 2188-			
2190, 2253, 2254.	2,123.89	.....	2,123.89
1918—I.H. 2349-			
2353 . . . . .	.....	14,150.00	10,019.25
Tennessee			
1917—I.H. 2255-			
2259	3,689.52	.....	2,007.69
1918—I.H. 2354-			
2358 . . . . .	.....	10,000.00	.....
Texas			
1918—I.H. 2359-			
2364 . . . . .	.....	9,866.68	.....
Virginia			
1917—I.H. 2199-			
2203	2,435.32	.....	2,435.32
1918—I.H. 2365-			
2370 . . . . .	.....	12,500.00	5,062.79
 Central America			
Costa Rica			
1917—I.H. 2205 ..	12,661.89	.....	12,661.89
1918—I.H. 2371 ..	.....	20,240.00	13,121.82
Guatemala			
1917—I.H. 2206 ..	2,189.17	.....	2,189.17
1918—I.H. 2372 ..	.....	18,186.46	12,203.21
Nicaragua			
1917—I.H. 2207 ..	2,725.72	.....	2,725.72
1918—I.H. 2373 ..	.....	21,500.00	12,439.20
Panama			
1917—I.H. 2208 ..	4,103.68	.....	4,103.68
1918—I.H. 2374 ..	.....	20,645.00	9,747.25
Salvador			
1917—I.H. 2209 ..	3,300.71	.....	2,036.69
1918—I.H. 2375,			
2559 . . . . .	.....	10,070.00	7,440.94
 <i>Carried Forward</i>	 \$47,455.89	 \$197,874.02	 \$127,263.68

EXHIBIT I—*Continued*

	PRIOR APPROPRIA- TIONS	1918 APPROPRIA- TIONS	1918 PAYMENTS
<i>Brought Forward</i>	\$47,455.89	\$197,874.02	\$127,263.68
<i>HOOKWORM WORK (Cont'd)</i>			
South America			
Brazil			
1917—I.H. 2235, 2279, 2280, 2294- 2296	9,467.20	.....	9,134.05
1918—I.H. 2376- 81, 2404, 2423, 2432, 2440, 2460, 2451, 2457, 2444	.....	103,217.50	37,048.79
British Guiana			
1917—I.H. 2211, 2237	5,534.18	.....	3,367.90
1918—I.H. 2382 ..	.....	14,386.82	9,614.19
Dutch Guiana			
1917—I.H. 2213 ..	1,820.65	.....	1,820.65
1918—I.H. 2383 ..	.....	12,460.00	1,992.42
British West Indies			
Antigua			
1917—I.H. 2210 ..	4,133.45	.....	885.55
Grenada			
1917—I.H. 2214 ..	114.85	.....	114.85
1918—I.H. 2384 ..	.....	6,614.00	936.30
Jamaica			
1918—I.H. 2445, 2466 . . . . .	.....	7,641.00	1,671.82
St. Lucia			
1917—I.H. 2215 ..	1,749.98	.....	1,749.98
1918—I.H. 2385 ..	.....	8,288.60	5,759.35
St. Vincent			
1917—I.H. 2216 ..	3,777.67	.....	942.86
1918—I.H. 2386 ..	.....	7,703.60	1,986.84
Trinidad			
1917—I.H. 2218 ..	1,595.27	.....	1,595.27
1918—I.H. 2387, 2560 . . . . .	.....	8,870.00	5,656.85
The East			
Ceylon			
1917—I.H. 2219 ..	4,667.37	.....	Cr. 9,477.59
1918—I.H. 2426, 2388 . . . . .	.....	12,116.00	7,531.95
China			
1917—I.H. 2282 ..	2,126.72	.....	252.31
1918—I.H. 2438 ..	.....	11,400.00	1,243.88
<i>Carried Forward</i>	\$82,443.23	\$390,571.54	\$211,091.90

EXHIBIT I—*Continued*

	PRIOR APPROPRIA- TIONS	1918 APPROPRIA- TIONS	1918 PAYMENTS
<i>Brought Forward</i>	\$82,443.23	\$390,571.54	\$211,091.90
<i>HOOKWORM WORK (Cont'd)</i>			
<i>The East (Cont'd)</i>			
Egypt			
1915—I.H. 237 . . .	15,891.88	.....	.....
Federated Malay States			
Hookworm Com- mission			
1917—I.H. 2220 ..	8,997.17	.....	.....
Fiji Islands			
1917—I.H. 2243, 2249	432.40	.....	432.40
1918—I.H. 2389 ..	.....	5,395.96	1,880.59
Papua and Queens- land—Survey ..			
1917—I.H. 2238 ..	1,926.13	.....	333.14
Papua			
1918—I.H. 2430 ..	.....	2,100.00	2,009.41
Philippine Hospital Ship			
1917—I.H. 2221 ..	12,500.00	.....	.....
1918—I.H. 2428 ..	.....	12,500.00	6,000.00
Queensland			
1918—I.H. 2431, 2561 . . . . .	.....	6,300.00	6,128.46
Seychelles Islands			
1917—I.H. 2245, 2277	1,624.48	.....	514.77
1918—I.H. 2419 ..	.....	6,500.00	3,014.24
Siam			
1917—I.H. 2244 ..	309.39	.....	309.39
1918—I.H. 2390 ..	.....	9,317.08	7,029.61
<i>Field Expenses not Cov- ered by Budgets</i>			
Salaries of Field Staff			
1918—I.H. 2396 ..	.....	180,000.00	133,204.30
Traveling Expenses of Field Staff			
1917—I.H. 2183 ..	26,690.97	.....	7,114.00
1918—I.H. 2398 ..	.....	60,000.00	25,890.38
Commutation of Field Staff			
1918—I.H. 2397 ..	.....	25,000.00	9,048.07
Study Leave for mem- bers of the staff			
1918—I.H. 2468 ..	.....	500.00	.....
<i>Carried Forward</i>	\$150,815.65	\$698,184.58	\$419,000.66

EXHIBIT I—*Continued*

	PRIOR APPROPRIA- TIONS	1918 APPROPRIA- TIONS	1918 PAYMENTS
<i>Brought Forward</i>	\$150,815.65	\$698,184.58	\$419,000.66
HOOKWORM WORK (<i>Cont'd</i>)			
Field Expenses not Covered by Budgets (<i>Cont'd</i>)			
Traveling Expenses of Families of Field Staff			
1917—I.H. 2278 ..	300.97	.....	300.97
1918—I.H. 2399, 2446.....	.....	8,000.00	6,621.49
Drugs for conserving health of mem- bers of the Field Staff			
1918—I.H. 2403 ..	.....	500.00	202.50
Medical examination of applicants for membership on the Field Staff			
1918—I.H. 2429 ..	.....	250.00	.....
Purchase of automo- biles for use of directors in train- ing			
1918—I.H. 2402 ..	.....	3,000.00	320.97
Field equipment and supplies . . .			
1918—I.H. 2400 ..	.....	3,000.00	3,000.00
Miscellaneous			
Conference of health officers of the south- ern states—I.H.			
2310.....	.....	3,500.00	2,990.76
Investigation of sew- age disposal in rural homes—I.H. 2284, 2309.....			
	5,359.11	10,000.00	8,868.52
Lecture charts on hookworm disease —I.H. 2248.....			
	225.80	.....	17.40
School charts on hook- worm disease—I.H.			
2270.....	929.73	.....	.....
Pamphlets and charts —I.H. 2414.....			
	.....	4,000.00	3,999.49
<i>Carried Forward</i>	\$157,631.26	\$730,434.58	\$445,322.76

TREASURER'S REPORT

311

EXHIBIT I—Continued

	PRIOR APPROPRIA- TIONS	1918 APPROPRIA- TIONS	1918 PAYMENTS
<i>Brought Forward</i>	\$157,631.26	\$730,434.58	\$445,322.76
HOOKWORM WORK (Cont'd)			
Miscellaneous (Cont'd)			
Motor boat for Dutch Guiana—I.H. 2231	289.35	.....	199.71
Portable house and of- fice for use of direc- tor in Salvador— I.H. 2285, 2293, 2411, 2449.	2,523.10	1,200.00	3,468.45
MALARIA WORK			
Southern States			
Arkansas			
1917—I.H. 2250 ..	1,134.90	.....	1,134.90
1918—I.H. 2433 ..	.....	1,350.00	539.24
Mississippi			
1917—I.H. 2204 ..	15,255.98	.....	9,713.83
1918—I.H. 2424, 2450, 2455, 2425	.....	17,365.00	12,159.73
YELLOW FEVER WORK			
Yellow Fever Commis- sion 1918—I.H. 2439	.....	2,849.15	2,849.15
Yellow Fever Commis- sion—Ecuador 1918 —I.H. 2452. . . . .	.....	26,750.00	21,891.28
Yellow Fever Control— Guayaquil, Ecuador— I.H. 2239, 2459. . .	.....	20,000.00	10.00
East Coast of Brazil— I.H. 2240.	3,390.58	.....	6.87
Coro, Venezuela— I.H. 2418. . . . .	.....	5,000.00	.....
Guatemala—I.H. 2458. . . . .	.....	25,000.00	10,026.96
Salaries of Yellow Fever Commission—I.H. 2241.	35,000.00	.....	6,200.00
Traveling expenses of Yellow Fever Com- mission—I.H. 2242	11,496.45	.....	980.99
<i>Carried Forward</i>	\$226,721.62	\$829,948.73	\$514,503.87

EXHIBIT I—*Continued*

	PRIOR APPROPRIA- TIONS	1918 APPROPRIA- TIONS	1918 PAYMENTS
<i>Brought Forward</i>	\$226,721.62	\$829,948.73	\$514,503.87
TUBERCULOSIS WORK IN FRANCE			
Inauguration of work —I.H. 2281	6,420.92	.....	92.66
Central Administration 1917—I.H. 2314	10,142.42	.....	8,466.58
1918—I.H. 2415, 2435, 2436 . . . . .	.....	84,700.00	75,665.98
Educational Division 1917—I.H. 2316	16,252.00	.....	12,954.08
1918—I.H. 2417, 2437 . . . . .	.....	77,400.00	76,179.41
Medical Division 1917—I.H. 2315	28,586.29	.....	16,870.90
1918—I.H. 2416, 2436 .....	.....	262,300.00	255,144.08
Dr. L. Farrand—Addi- tional Compensation—I.H. 2453- 2454 . . . . .	.....	2,200.00	2,200.00
MEDICAL EDUCATION			
Sao Paulo—Depart- ment of Hygiene Equipment—I.H. 2312, 2443	9,820.41	5,000.00	13,085.46
Operation—I.H. 2313 .....	.....	12,500.00	1,316.24
Borgas, Dr. F.—Fellow- ship—I.H. 2441 . . . . .	.....	1,900.00	1,491.04
Chagas, Dr. C. P.—Fel- lowship—I.H. 2311, 2442, 2463	1,678.15	3,150.00	2,353.98
Souza, Dr. C. P.—Fel- lowship—I.H. 2456 .....	.....	1,900.00	634.03
MISCELLANEOUS			
Survey & Exhibits Administration 1918— I.H. 2394, 2448 . . . . .	.....	16,500.00	14,970.85
Express, Freight & Ex- change—I.H. 2401, 2447 . . . . .	.....	13,000.00	11,121.79
<i>Carried Forward</i>	\$299,621.81	\$1,310,498.73	\$1,007,050.95

EXHIBIT I—*Continued*

	PRIOR APPROPRIA- TIONS	1918 APPROPRIA- TIONS	1918 PAYMENTS
<i>Brought Forward</i>	\$299,621.81	\$1,310,498.73	\$1,007,050.95
ADMINISTRATION			
Home Office—I.H. 2395, 2412, 2562	6,883.90	84,146.28	82,242.97
TOTALS	\$306,505.71	\$1,394,645.01	\$1,089,293.92
Balance of funds appro- priated by the Rocke- feller Foundation for the Board's work during 1918 remaining unappro- priated by the Inter- national Health Board on December 31, 1918.		105,354.99	
		1,500,000.00	
Unexpended balances of appropriations and unap- propriated balance al- lowed to elapse	127,454.37	158,956.46	
NET TOTALS . . .	\$179,051.34	\$1,341,043.54	\$1,089,293.92

EXHIBIT J*

1918 CHINA MEDICAL BOARD APPROPRIATIONS,
UNPAID BALANCES OF APPROPRIATIONS MADE IN PREVIOUS YEARS,
AND PAYMENTS THEREON MADE IN 1918

	PRIOR APPROPRIA- TIONS	1918 APPROPRIA- TIONS	1918 PAYMENTS
MISSIONARY SOCIETIES			
—HOSPITALS			
American Baptist For- eign Mission So- ciety			
(C.M. 276) Ningpo Hospital—For salaries of doc- tor and nurse, \$2,250.00 per year for five years beginning with 1918. (Install- ment due 1918).	.....	\$2,250.00	.....
(C.M. 277) Shaoh- sing Hospital— For support of foreign nurse, Chinese business manager and foreign doctor, \$2,475.00 per year for five years beginning with 1918. (In- stallment due 1918).....	.....	2,475.00	.....
(C.M. 278) Shaoh- sing Hospital— Equipment, and residences for Chinese staff, nurse and phy- sician.....	\$8,512.50	.....	\$2,887.50
(C.M. 2319) Sha- ohsing Hospital —X-ray Outfit .	.....	1,050.00	1,050.00
<i>Carried Forward</i>	<i>\$8,512.50</i>	<i>\$5,775.00</i>	<i>\$3,937.50</i>

* The Foundation provides for the cost of work carried on by the China Medical Board by making to the Board one or more appropriations to cover its work for the year. From these large grants the Board then makes its own appropriations for specific objects.

EXHIBIT J—*Continued*

	PRIOR APPROPRIA- TIONS	1918 APPROPRIA- TIONS	1918 PAYMENTS
<i>Brought Forward . . .</i>	\$8,512.50	\$5,775.00	\$3,937.50
MISSIONARY SOCIETIES			
—HOSPITALS			
<i>(Cont'd)</i>			
American Board of Commissioners for Foreign Mis- sions			
(C.M. 211, 294) Tehchow Hos- pital—For sal- ary of two doc- tors, \$3,236.00 per year for five years beginning with 1915. (Balance due on previous installments) . . .	7,336.50	.....	1,054.00
(Installment due 1918) . . . . .	.....	3,236.00	.....
(C.M. 297, 2229) Tehchow Hos- pital—Employes salaries, \$4,152.00 per year for five years beginning with 1916. (Bal- ance due on pre- vious installments (Installment due 1918)	4,942.50	.....	3,018.35
(C.M. 2332) Teh- chow Hospital— For repairs and improvements made necessary by the floods of 1917 . . . . .	.....	1,500.00	.....
(C.M. 2333) Teh- chow Hospital— For the construc- tion of a dike . . .	.....	1,800.00	.....
<i>Carried Forward . . .</i>	\$20,791.50	\$16,463.00	\$8,009.85

EXHIBIT J—*Continued*

	PRIOR APPROPRIA- TIONS	1918 APPROPRIA- TIONS	1918 PAYMENTS
<i>Brought Forward</i>	\$20,791.50	\$16,463.00	\$8,009.85
MISSIONARY SOCIETIES —HOSPITALS (<i>Cont'd</i>)			
Board of Foreign Mis- sions of the Meth- odist Episcopal Church (C.M. 283, 2176)			
Wuhu Hospital —For salary and allowance of doc- tor, \$900.00 per year for five years beginning with 1916. (Balance of installment due 1917)	300.00	.....	.....
(Installment due 1918) . . . . .	.....	900.00	900.00
(C.M. 223, 2102)			
Peking Hospital —Salary of doc- tor, \$2,400.00 per year for five years beginning with 1916. (Balance of installment due 1917)	1,600.00	.....	.....
(Installment due 1918) . . . . .	.....	2,400.00	.....
(C.M. 2266) Pe- king Hospital— For support of dentist, medical practitioner and nurse, \$22,500.00 extending over a period of five years beginning with 1918. (In- stallment due 1918) . . . . .	.....	6,000.00	.....
<i>Carried Forward</i>	\$22,691.50	\$25,763.00	\$8,909.85

TREASURER'S REPORT

317

EXHIBIT J—Continued

	PRIOR APPROPRIA- TIONS	1918 APPROPRIA- TIONS	1918 PAYMENTS
<i>Brought Forward . . .</i>	\$22,691.50	\$25,763.00	\$8,909.85
MISSIONARY SOCIETIES —HOSPITALS (<i>Cont'd</i>)			
Board of Missions of the Metho- dist Episcopal Church, South— (C.M. 236, 2105) Soochow Hospi- tal—For salary of nurse, \$600.00 per year for five years beginning with 1916. (In- stallment due 1917)	600.00	.....	.....
(Installment due 1918) . . . . .	.....	600.00	.....
Board of Missions of the Methodist E p i s c o p a l Church, South— American Bap- tist Foreign Mis- sion Society, Jointly (C.M. 2151) New Union Hospital at Huchow—For building and equipment	20,000.00	.....	.....
(C.M. 2152) Hos- pital at Huchow —For support of a Foreign physi- cian, \$5,025.00 extending over a period of five years beginning with 1918. (In- stallment due 1918) . . . . .	.....	1,650.00	.....
<i>Carried Forward . . .</i>	\$43,291.50	\$28,013.00	\$8,909.85

EXHIBIT J—*Continued*

	PRIOR APPROPRIA- TIONS	1918 APPROPRIA- TIONS	1918 PAYMENTS
<i>Brought Forward . . .</i>	\$43,291.50	\$28,013.00	\$8,909.85
MISSIONARY SOCIETIES —HOSPITALS (<i>Cont'd</i>)			
Board of Missions of the Methodist Episcopal Church, South—American Baptist Foreign Mission Society, Jointly (<i>Cont'd</i>)			
(C.M. 2153) Hos- pital at Huchow —For support of a foreign nurse, \$3,000.00 ex- tending over a period of five years beginning with 1918. (In- stallment due 1918).....	.....	825.00	.....
(C.M. 2154) Hos- pital at Huchow —For support of a Chinese physi- cian, \$2,250.00 extending over a period of five years beginning with 1918. (In- stallment due 1918).....	.....	450.00	.....
Board of Foreign Mis- sions of the Pres- byterian Church in the U. S. A. (C.M. 2144) Chang- teh Hospital— For current ex- penses, \$2,625.00 per year for five years beginning with 1916. (Bal- ance due on pre- vious installments) (Installment due 1918).....	4,200.00 .....	..... 2,625.00	1,293.75
<i>Carried Forward . . .</i>	\$47,491.50	\$31,913.00	\$10,203.60

TREASURER'S REPORT

319

EXHIBIT J—*Continued*

	PRIOR APPROPRIA- TIONS	1918 APPROPRIA- TIONS	1918 PAYMENTS
<i>Brought Forward . . .</i>	\$47,491.50	\$31,913.00	\$10,203.60
MISSIONARY SOCIETIES —HOSPITALS (<i>Cont'd</i>)			
Board of Foreign Mis- sions of the Pres- byterian Church in the U. S. A. (<i>Cont'd</i>)			
(C.M. 2145) Chang- teh Hospital— For capital ex- penditures	13,050.00	.....	13,050.00
(C.M. 2318) Chang- teh Hospital— For running ex- penses, \$2,250.00 per year for five years beginning with 1918. (In- stallment due 1918) . . . . .	.....	2,250.00	2,250.00
(C.M. 284) Chefoo Hospital—For salary and allow- ance of doctor and nurse, \$2,625.00 per year for five years beginning with 1917. (Bal- ance of install- ment due 1917). (Installment due 1918)	1,800.00	.....	.....
(C.M. 2243) Che- foo Hospital— For operating ex- penses \$2,250.00 per year for five years beginning with 1918. (In- stallment due 1918) . . . . .	.....	2,625.00	.....
(C.M. 2243) Che- foo Hospital— For operating ex- penses \$2,250.00 per year for five years beginning with 1918. (In- stallment due 1918) . . . . .	.....	2,250.00	2,250.00
<i>Carried Forward . . .</i>	\$62,341.50	\$39,038.00	\$27,753.60

EXHIBIT J—*Continued*

	PRIOR APPROPRIA- TIONS	1918 APPROPRIA- TIONS	1918 PAYMENTS
<i>Brought Forward</i>	\$62,341.50	\$39,038.00	\$27,753.60
MISSIONARY SOCIETIES —HOSPITALS (<i>Cont'd</i>)			
Board of Foreign Mis- sions of the Pres- byterian Church in the U. S. A. (<i>Cont'd</i>)			
(C.M. 285) Hwai- yuen Hospital— For salary and allowance of phy- sician and nurse, and operating ex- penses, \$3,375.00 per year for five years beginning with 1918. (In- stallment due 1918) . . . . .	.....	3,375.00	.....
(C.M. 286) Hwai- yuen Hospital— For residence of doctor and equip- ment	5,250.00	.....	.....
(C.M. 214, 295) Paotingfu — for salaries of doctor and two nurses; Shuntehfu — For salaries of doctor and two nurses, \$9,200.00 per year for five years be- ginning with 1916. (Balance due on previous install- ments)	13,600.00	.....	9,200.00
(Installment due 1918) . . . . .	.....	9,200.00	5,075.00
<i>Carried Forward</i>	\$81,191.50	\$51,613.00	\$42,028.60

EXHIBIT J—*Continued*

	PRIOR APPROPRIA- TIONS	1918 APPROPRIA- TIONS	1918 PAYMENTS
<i>Brought Forward . . .</i>	\$81,191.50	\$51,613.00	\$42,028.60
MISSIONARY SOCIETIES			
—HOSPITALS			
(<i>Cont'd</i>)			
Board of Foreign Mis- sions of the Pres- byterian Church in the U. S. A.			
(<i>Cont'd</i>)			
(C.M. 2306) Pao- tingfu Hospital— For the support of a business manager, \$900.00 per year for five years beginning with 1918. (In- stallment due 1918) . . . . .	.....	900.00	.....
(C.M. 2142) Shun- tehfu Hospital— For maintenance, \$750.00 per year for five years be- ginning with 1916. (Installment due 1917)	750.00	.....	687.50
(Installment due 1918) . . . . .	.....	750.00	.....
Board of Foreign Mis- sions of the Re- formed Church in America			
(C.M. 2282) Hope & Wilhelmina Hospital—For purchase of pump, well and engine and electric light plant. . . . .	.....	2,025.00	.....
<i>Carried Forward . . .</i>	\$81,941.50	\$55,288.00	\$42,716.10

EXHIBIT J—*Continued*

	PRIOR APPROPRIA- TIONS	1918 APPROPRIA- TIONS	1918 PAYMENTS
<i>Brought Forward . . .</i>	\$81,941.50	\$55,288.00	\$42,716.10
MISSIONARY SOCIETIES —HOSPITALS (<i>Cont'd</i>)			
Board of Foreign Mis- sions of the Re- formed Church in America (<i>Cont'd</i>)			
(C.M. 2283) Hope & Wilhelmina Hospital—For support of phy- sician, \$1,881.00 per year for five years beginning with 1918. (In- stallment due 1918) . . . . .	.....	1,881.00	.....
Canton Christian Col- lege (C.M. 2139) Can- ton Hospital— For a business manager and cur- rent expenses, \$4,- 500.00 per year for five years be- ginning with 1917. (Installment due 1918) . . . . .	.....	4,500.00	4,500.00
Church of Scotland Foreign Mission Committee (C.M. 288) Ichang Hospital—For equipment	375.00	.....	.....
(C.M. 289) Ichang Hospital—For support of a third foreign doctor and nurse, \$2,250.00 per year for five years beginning with 1918 . . . . .	.....	2,250.00	.....
<i>Carried Forward . . .</i>	\$82,316.50	\$63,919.00	\$47,216.10

EXHIBIT J—*Continued*

	PRIOR APPROPRIA- TIONS	1918 APPROPRIA- TIONS	1918 PAYMENTS
<i>Brought Forward . . .</i>	\$82,316.50	\$63,919.00	\$47,216.10
MISSIONARY SOCIETIES —HOSPITALS (<i>Cont'd</i>)			
Domestic & Foreign Mission Society of the Protestant Episcopal Church in the U. S. A. (C.M. 2307) St. James Hospital, Anking—For buildings and equipment. . . . .	.....	17,625.00	.....
(C.M. 2308) St. James Hospital, Anking — For operating expenses, \$4,200.00 per year for five years beginning 1918. (Installment due 1918) . . . . .	.....	4,200.00	.....
Executive Committee of Foreign Mis- sions of the Pres- byterian Church in the U.S., South (C.M. 221, 2101) Soochow — For salary, outfit and travel to field of doctor and for- eign nurse; Kash- ing—For salary, outfit and travel to field of foreign nurse. Salaries \$3,600.00 per year for five years be- ginning with 1915. (Balance due on previous install- ments)	8,225.00	.....	900.00
(Installment due 1918) . . . . .	.....	3,600.00	.....
<i>Carried Forward . . .</i>	\$90,541.50	\$89,344.00	\$48,116.10

EXHIBIT J—*Continued*

	PRIOR APPROPRIA- TIONS	1918 APPROPRIA- TIONS	1918 PAYMENTS
<i>Brought Forward</i>	\$90,541.50	\$89,344.00	\$48,116.10
MISSIONARY SOCIETIES			
—HOSPITALS			
<i>(Cont'd)</i>			
Foreign Christian Mis- sionary Society			
(C.M. 215, 2100)			
Luchowfu — For			
salary, allow-			
ance and out-			
fit of doctor and			
nurse; Nantung-			
chow—For salary,			
allowance and out-			
fit of nurse. Sal-			
aries and allow-			
ances \$4,200.00			
per year for five			
years beginning			
with 1918. (In-			
stallment due			
1918)			
	.....	4,600.00	3,595.00
(C.M. 2218) Nan-			
tungchow Hospi-			
tal—For support			
of a second phy-			
sician, \$8,400.00			
extending over a			
period of five			
years beginning			
with 1918. (In-			
stallment due			
1918)			
	.....	1,800.00	.....
(C.M. 2219) Nan-			
tungchow Hospi-			
tal—For doctor's			
residence			
	3,000.00	.....	.....
(C.M. 2327) Lu-			
chowfu Hospital			
—For buildings			
and fixed equip-			
ment			
	.....	18,500.00	.....
(C.M. 2328) Lu-			
chowfu Hospital			
—For movable			
equipment			
	.....	4,800.00	.....
<i>Carried Forward</i>	\$93,541.50	\$119,044.00	\$51,711.10

EXHIBIT J—*Continued*

	PRIOR APPROPRIA- TIONS	1918 APPROPRIA- TIONS	1918 PAYMENTS
<i>Brought Forward</i> . . .	\$93,541.50	\$119,044.00	\$51,711.10
MISSIONARY SOCIETIES —HOSPITALS (<i>Cont'd</i>)			
Foreign Christian Mis- sionary Society (<i>Cont'd</i>)			
(C.M. 2329) Lu- chowfu Hospital —For increased maintenance ex- penses; \$4,100.00 per year for five years beginning 1918. (Install- ment due 1918).	.....	4,100.00	.....
(C.M. 2330) Lu- chowfu Hospital —For salary of a second foreign nurse, \$1,400.00 per year for five years beginning 1918. (Install- ment due 1918).	.....	1,400.00	.....
(C.M. 2331) Lu- chowfu Hospital —For salary of a business manager, \$1,400.00 per year for five years be- ginning 1918. (Installment due 1918).....	.....	1,400.00	.....
Foreign Mission Board of the Southern Baptist Conven- tion (C.M. 228, 2106) Chengchow Hos- pital — For sal- ary of doctor, \$1,200.00 per year for five years be- ginning with 1916. (Balance of in- stallment due 1917).....	850.00	.....	850.00
(Installment due 1918).....	.....	1,200.00	50.00
<i>Carried Forward</i> . . .	\$94,391.50	\$127,144.00	\$52,611.10

EXHIBIT J—*Continued*

	PRIOR APPROPRIA- TIONS	1918 APPROPRIA- TIONS	1918 PAYMENTS
<i>Brought Forward</i>	\$94,391.50	\$127,144.00	\$52,611.10
MISSIONARY SOCIETIES —HOSPITALS (<i>Cont'd</i>)			
Foreign Mission Board of the Southern Baptist Conven- tion (<i>Cont'd</i>)			
(C.M. 281) Hwang- hien Hospital— For salary of phy- sician, \$900.00 per year for five years beginning with 1918. (Install- ment due 1918)	.....	900.00	.....
(C.M. 282) Hwang- hien Hospital— For outfit and travel of a physi- cian	750.00	.....	.....
(C.M. 225, 2103) Warren Memorial Hospital, Hwang- hien — For salary of nurse, \$600.00 per year for five years beginning with 1916. (Bal- ance of install- ment due 1917)	150.00	.....	150.00
(Installment due 1918) .....	.....	600.00	300.00
(C.M. 280) Laichow- fu Hospital—For equipment and outgoing expenses of physician and wife	750.00	.....	.....
(C.M. 279) Lai- chowfu Hospital —For salary of physician and wife, and nurse, \$1,- 650.00 per year for five years be- ginning with 1918. (Installment due 1918) .....	.....	1,650.00	.....
<i>Carried Forward</i>	\$96,041.50	\$130,294.00	\$53,061.10

EXHIBIT J—*Continued*

	PRIOR APPROPRIA- TIONS	1918 APPROPRIA- TIONS	1918 PAYMENTS
<i>Brought Forward</i> . . .	\$96,041.50	\$130,294.00	\$53,061.10
MISSIONARY SOCIETIES —HOSPITALS (<i>Cont'd</i>)			
Foreign Mission Board of the Southern Baptist Conven- tion (<i>Cont'd</i>)			
(C.M. 232, 2104) Yangchow Hospi- tal—For salary of nurse, \$600.00 per year for five years beginning with 1916. (Bal- ance of install- ment due 1917) .	425.00	.....	425.00
(Installment due 1918) . . . . .	.....	600.00	25.00
(C.M. 2316) Yang- chow Hospital— For land, build- ings and fixed equipment . . . .	.....	30,000.00	28,125.00
(C.M. 2317) Yang- chow Hospital— For movable equipment . . . .	.....	6,000.00	.....
London Missionary Society			
(C.M. 2167) Siao- chang Hospital— For support of nurse, \$600.00 per year for five years beginning with 1918. (Install- ment due 1918) .	.....	600.00	.....
(C.M. 2326) Tsang- chow Hospital— For the support of a nurse, \$750.00 per year for five years beginning 1918. (Install- ment due 1918) .	.....	750.00	750.00
<i>Carried Forward</i> . . .	\$96,466.50	\$168,244.00	\$82,386.10

EXHIBIT J—*Continued*

	PRIOR APPROPRIA- TIONS	1918 APPROPRIA- TIONS	1918 PAYMENTS
<i>Brought Forward . . .</i>	\$96,466.50	\$168,244.00	\$82,386.10
MISSIONARY SOCIETIES —HOSPITALS (<i>Cont'd</i>)			
Medical Mission Aux- iliary of London. (C.M. 2201) Tai Yuan Fu Hospi- tal—For improve- ments and sup- plies	3,150.00	.....	.....
United Free Church of Scotland (C.M. 2232) Muk- den Hospital— For support of nurse \$750.00 per year for five years beginning with 1918. (Install- ment due 1918) .	.....	750.00	.....
(C.M. 2233) Muk- den Hospital— For improvements	9,000.00	.....	9,000.00
University of Nan- king (C.M. 2137) For current expenses of its hospital, \$9,250.00 per year for five years be- ginning with 1917. (Installment due 1918) . . . . .	.....	9,250.00	9,250.00
(C.M. 2138) For buildings and equipment	12,000.00	.....	12,000.00
Loss in Exchange (C.M. 2251) To cover loss in ex- change on pay- ments to Mission- ary Societies for their hospitals during 1917	20,000.00	.....	9,297.30
<i>Carried Forward . . .</i>	\$140,616.50	\$178,244.00	\$121,933.40

EXHIBIT J—*Continued*

	PRIOR APPROPRIA- TIONS	1918 APPROPRIA- TIONS	1918 PAYMENTS
<i>Brought Forward</i>	\$140,616.50	\$178,244.00	\$121,933.40
MISSIONARY SOCIETIES —HOSPITALS (<i>Cont'd</i>)			
Loss in Exchange (<i>Cont'd</i>)			
(C.M. 2252) To cover loss in ex- change on pay- ment to Mission- ary Societies, for their hospitals dur- ing 1918. . . . .	.....	93,000.00	1,752.58
FELLOWSHIPS			
Medical Missionaries and Nurses on Furlough	14,171.05	23,700.00	24,162.82
Medical Fellow- ships, Chinese . .	6,793.96	11,467.00	8,755.68
Miscellaneous Fel- lowships	11,185.00	1,000.00	5,625.00
SCHOLARSHIPS			
Students of Harvard Medical School in China	7,487.17	6,750.00	8,572.91
Chinese Pharma- cists	2,055.00	300.00	1,800.00
Chinese Nurses . .	3,450.00	4,400.00	2,658.98
MEDICAL SCHOOLS— UNAFFILIATED			
Fukien Christian Uni- versity (C.M. 2273 For building and equip- ment for Science Department . . .	.....	50,000.00	.....
St. John's University of Penn. Medical School (C.M. 2310) For the support of Dr. Herman Bryan for the school year 1918-19 . . . . .	.....	1,500.00	1,500.00
<i>Carried Forward</i>	\$185,758.68	\$370,361.00	\$176,761.37

EXHIBIT J—*Continued*

	PRIOR APPROPRIA- TIONS	1918 APPROPRIA- TIONS	1918 PAYMENTS
<i>Brought Forward</i>	\$185,758.68	\$370,361.00	\$176,761.37
MEDICAL SCHOOLS— UNAFFILIATED (<i>Cont'd</i>)			
Tsinanfu Union Medi- cal College (C.M. 251) For buildings and equipment	3,236.55	.....	3,236.55
(C.M. 252) Expense of educating stu- dents, sent to Tsinanfu by the China Medical Board during a period of five years	61,849.10	.....	21,849.10
(C.M. 2217) To cover loss in ex- change in con- nection with ap- propriations C.M. 251 and C.M. 252 . .	20,000.00	.....	14,763.45
Yale Foreign Mis- sionary Society (C.M. 27) For sup- port of Hunan- Yale Medical School, Changsha, \$16,200.00 per year for five years beginning with 1915. (Bal- ance of install- ment due 1917).. (Installment due 1918)	8,100.00 .....	..... 16,200.00	8,100.00 8,100.00
(C.M. 2133) For laboratory and equipment at Hunan-Yale Med- ical School	10,000.00	.....	.....
<i>Carried Forward</i>	\$288,944.33	\$386,561.00	\$232,810.47

EXHIBIT J—Continued

	PRIOR APPROPRIA- TIONS	1918 APPROPRIA- TIONS	1918 PAYMENTS
<i>Brought Forward . . .</i>	\$288,944.33	\$386,561.00	\$232,810.47
MEDICAL SCHOOLS—			
UNAFFILIATED			
<i>(Cont'd)</i>			
Yale Foreign Mission- ary Society			
<i>(Cont'd)</i>			
(C.M. 2230) For ex- tended budget of Hunan-Yale Med- ical School, \$9,- 000.00 extending over a period of three years begin- ning with 1917. (Installment due 1918).....	.....	3,000.00	.....
(C.M. 2231) For support of a third instructor in the Pre-Medical De- partment of the Hunan-Yale Med- ical School \$6,- 200.00 extending over a period of three years begin- ning with 1917. (Installment due 1918).....	.....	2,000.00	.....
MEDICAL SCHOOLS—			
AFFILIATED			
Peking Union Medi- cal College Assets			
(C.M. 213, 248, 249, 2170, 2212, 2213, 2290) Purchase of additional property.....	36,953.02	65.26	3,262.21
(C.M. 2196, 2228, 2267, 2312, 2337) Buildings and fixed equipment.	252,600.00	1,447,400.00	1,575,708.43
(C.M. 2197) Mov- able equipment.	25,000.00	.....	1,762.54
<i>Carried Forward . . .</i>	\$603,497.35	\$1,839,026.26	\$1,813,543.65

EXHIBIT J—*Continued*

	PRIOR APPROPRIA- TIONS	1918 APPROPRIA- TIONS	1918 PAYMENTS
<i>Brought Forward</i>	\$603,497.35	\$1,839,026.26	\$1,813,543.65
MEDICAL SCHOOLS— AFFILIATED (<i>Cont'd</i>)			
Peking Union Medical College Assets (<i>Cont'd</i>)			
(C.M. 2268, 2334) Library . . . . .	.....	20,000.00	10,436.34
(C.M. 2198) Ac- cessories	25,000.00	.....	.....
(C.M. 2161) Ac- cessories, Pre- Medical School .	15,000.00	.....	10,231.59
(C.M. 2188, 2214) Repairs and al- terations	32,800.00	.....	18,264.75
Operation in China (C.M. 2107) Bud- get 1915-16	9,224.77	.....	9,224.77
(C.M. 273) Bud- get 1916-17	20,160.09	.....	430.76
(C.M. 2190) Bud- get 1917-18	92,000.00	.....	92,000.00
(C.M. 2257) Bud- get 1918-19 . . . .	.....	112,500.00	2,398.02
(C.M. 2162) Bud- get 1917-18 Pre- Medical School .	25,000.00	.....	640.59
(C.M. 2262) Outfit and travel of doc- tor	615.87	.....	615.87
Administration in the U. S. A. (C.M. 2191, 2279) Budget 1917-18 .	19,960.45	700.00	6,322.10
(C.M. 2258) Bud- get 1918-19 . . . .	.....	9,500.00	4,684.84
Red Cross Hospital, Shanghai Opera- tion (C.M. 256, 268, 2248) Budget 1917-18	56,349.11	.....	35,337.83
<i>Carried Forward</i>	\$899,607.64	\$1,981,726.26	\$2,004,131.11

TREASURER'S REPORT

333

EXHIBIT J—Continued

	PRIOR APPROPRIA- TIONS	1918 APPROPRIA- TIONS	1918 PAYMENTS
<i>Brought Forward . . .</i>	\$899,607.64	\$1,981,726.26	\$2,004,131.11
MEDICAL SCHOOLS— AFFILIATED (Cont'd)			
Shanghai Medical School			
Assets			
(C.M. 2199, 2270) Buildings and fixed equipment.	22,000.00	28,000.00	16,848.08
(C.M. 2271) Mov- able equipment..	.....	5,000.00	.....
(C.M. 2215) Li- brary.....	2,820.14	.....	190.35
(C.M. 2272) Acces- sories.....	.....	5,000.00	30.10
Shanghai Medical School Operation (C.M. 2259) Bud- get 1918-19....	.....	6,000.00	5,595.41
Purchase of land in China (C.M. 2110, 2269).	72,889.00	70,000.00	56,358.15
MISCELLANEOUS			
Emergency Fund (C.M. 2211) For aid of medical work of various kinds in China, at the discretion of the Resident Di- rector.....	3,000.00	.....	1,226.42
North China Ameri- can School (C.M. 2281) For maintenance dur- ing the year 1918- 19.....	.....	300.00	300.00
Peking Primary School and Kindergarten (C.M. 2280) For maintenance dur- ing the year 1918- 19.....	.....	500.00	500.00
<i>Carried Forward . . .</i>	\$1,000,316.78	\$2,096,526.26	\$2,085,179.62

EXHIBIT J—*Continued*

	PRIOR APPROPRIA- TIONS	1918 APPROPRIA- TIONS	1918 PAYMENTS
<i>Brought Forward</i>	\$1,000,316.78	\$2,096,526.26	\$2,085,179.62
MISCELLANEOUS			
(<i>Cont'd</i>)			
Study of Libraries in Medical Schools (C.M. 2278) For a study of libraries in medical schools of recognized standing . . . . .	.....	300.00	130.97
Translation Nurses Association of China (C.M. 2185, 2309) For translation of nursing text books	600.00	5,500.00	600.00
Peking Office—Ad- ministration (C.M. 274, 2195) Budget—Previous Years	9,775.42	.....	2,840.31
(C.M. 2193, 2261, 2277, 2289) Bud- get—1918	2,250.00	33,267.00	22,009.02
ADMINISTRATION			
Home Office (C.M. 2260, 2265, 2350) Budget 1918	1,820.40	27,227.00	20,828.36
TOTALS	\$1,014,762.60	\$2,162,820.26	\$2,131,588.28
Balance of funds appro- priated by the Rock- efeller Foundation for the Board's work during 1917, remain- ing unappropriat- ed by the China Medical Board on December 31, 1918.	.....	82,836.74	.....
<i>Totals Carried Forward</i>	\$1,014,762.60	\$2,245,657.00	\$2,131,588.28

TREASURER'S REPORT

335

EXHIBIT J—Continued

	PRIOR APPROPRIA- TIONS	1918 APPROPRIA- TIONS	1918 PAYMENTS
<i>Totals Brought Forward</i>	\$1,014,762.60	\$2,245,657.00	\$2,131,588.28
Unexpended portions of appropriations al- lowed to lapse			
C.M. 2188	\$1,446.08		
2265	461.20		
2250	6,935.11		
273	19,729.33		
2191	13,638.35		
2126	1,750.33		
2174	159.91		
2208	55.00		
	<hr/>		
	44,175.31	.....	.....
C.M. 2260	\$2,301.44		
2278	169.03		
2279	700.00		
2295	750.00		
2292	100.00		
2298	167.00		
2238	1,800.00		
2288	500.00		
R.F. 2280	40,302.00		
R.F. 2365	2,232.74		
	<hr/>		
	.....	49,022.21	.....
	<hr/>	<hr/>	<hr/>
NET TOTALS .	\$970,587.29	\$2,196,634.79	\$2,131,588.28
	<hr/>	<hr/>	<hr/>

EXHIBIT K

SUMMARY OF APPROPRIATIONS AND PAYMENTS

	PRIOR APPROPRIA- TIONS	1918 APPROPRIA- TIONS	1918 PAYMENTS
INTERNATIONAL HEALTH BOARD.	\$179,051.34	\$1,341,043.54	\$1,089,293.92
CHINA MEDICAL BOARD.....	970,587.29	2,196,634.79	2,131,588.28
WAR WORK.....	2,083,926.28	9,282,703.55	11,105,226.18
AFTER CARE OF INFANTILE PARAL- YSIS CASES.....	10,463.78	37,500.00	38,956.95
MENTAL HYGIENE.....	14,500.00	45,800.00	17,050.00
ROCKEFELLER INSTITUTE AND MEDICAL EDUCATION.....	146,873.28	175,425.14	288,277.84
SCHOOL OF HYGIENE AND PUBLIC HEALTH.....	278,470.30	110,617.00	91,959.97
MISCELLANEOUS.....	24,380.48	147,026.32	150,135.96
ADMINISTRATION.....	5,660.21	138,063.19	137,713.06
	<u>\$3,713,912.96</u>	<u>\$13,474,813.53</u>	<u>\$15,050,202.16</u>
Prior Appropriations.....		\$3,713,912.96	
1918 Appropriations.....		13,474,813.53	
Total Appropriations.....			\$17,188,726.49
1918 Payments.....			15,050,202.16
Balance Payable on Appropriations.....			<u>\$2,138,524.33</u>

EXHIBIT L

In addition to the foregoing, the Foundation has made pledges and appropriations which become effective in future years, and will require for payment the following amounts

YEAR 1919:

INTERNATIONAL HEALTH BOARD...	\$2,007,000.00	
CHINA MEDICAL BOARD.....	1,550,000.00	
WAR WORK.....	2,856,000.00	
MENTAL HYGIENE.....	66,000.00	
ROCKEFELLER INSTITUTE AND MEDICAL EDUCATION.....	1,010,000.00	
SCHOOL OF HYGIENE AND PUBLIC HEALTH.....	191,130.00	
MISCELLANEOUS.....	254,511.70	
		<u>\$7,934,641.70</u>
YEAR 1920.....		1,583,000.00
YEAR 1921.....		71,000.00
YEAR 1922.....		64,000.00
YEAR 1923.....		57,000.00
YEAR 1924....		15,000.00
		<u><u>\$9,724,641.70</u></u>

In addition to the foregoing, the China Medical Board had made pledges and appropriations which become effective in future years, and will require for payment the following accounts

YEAR 1919.....	\$1,393,754.00
YEAR 1920.....	308,708.00
YEAR 1921.....	83,781.00
YEAR 1922.....	66,206.00
YEAR 1923.....	22,700.00
	<u>\$1,875,149.00</u>

As the appropriation to the China Medical Board, included in the Foundation's requirements for future years, provides for the 1919 appropriation of the Board, this item is deducted.....

1,393,754.00

\$481,395.00

EXHIBIT M

STATEMENT OF APPROPRIATIONS AND PAYMENTS FROM INCOME
OF SPECIAL FUNDS

LAURA S. ROCKEFELLER

	1918 APPROPRIA- TIONS	PAYMENTS
(R.F. 2320) Baptist Ministers' Home Society of New York	\$500.00	\$500.00
(R.F. 2321) Baptist Home of Northern Ohio	500.00	500.00
(R.F. 2322) Euclid Avenue Baptist Church of Cleveland, Ohio	1,500.00	1,500.00
(R.F. 2323) Baptist Home for the Aged of New York City	500.00	500.00
	<u>\$3,000.00</u>	<u>\$3,000.00</u>

JOHN D. ROCKEFELLER

(R.F. 2324-25) Baptist Home for the Aged of New York City	<u>\$1,850.00</u>	<u>\$1,850.00</u>
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EXHIBIT N

STATEMENTS OF PRINCIPAL FUNDS

GENERAL FUND

Gifts from Mr. Rockefeller	\$120,765,856.00
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The total fund is invested in the securities listed in General Schedule, Exhibit Q.....	\$120,765,856.00
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ESTATE OF LAURA S. ROCKEFELLER FUND

Gifts.....	\$152,733.00
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The total fund is invested in the securities listed in General Schedule, Exhibit Q.....	\$152,733.00
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RESERVE

Balance December 31, 1918.....	\$1,215,912.85
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Gain on securities sold and re-deemed during the year.....	42,123.47
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	\$1,258,036.32
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The total fund is invested in the securities listed in General Schedule, Exhibit Q.....	\$1,258,036.32
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LAURA S. ROCKEFELLER FUNDS

Gifts comprising four separate Funds.....	\$49,300.00
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The total of these funds is invested in the securities listed in Exhibit R.....	\$49,300.00
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EXHIBIT N—*Continued*

JOHN D. ROCKEFELLER FUND

Gifts.....	\$37,000.00
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The total fund is invested in the securities listed in Exhibit R ...	\$37,000.00
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HENRY STURGIS GREW MEMORIAL FUND

Gift to Harvard Medical School of China transferred to the Foundation in trust.....	\$25,000.00
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The total fund is invested in the securities listed in Exhibit R ..	\$25,000.00
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ARTHUR THEODORE LYMAN ENDOWMENT

Amount received from Harvard Medical School of China and held as a principal fund for Shanghai Medical School.....	\$5,500.00
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Accounted for in cash on deposit	\$5,500.00
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EXHIBIT O

LAND, BUILDINGS AND EQUIPMENT FUNDS

Appropriations to December 31, 1917.....		\$812,704.92
Deduct refund on property of Peking Union Medical College.....	\$859.02	
Depreciation of Foundation's equipment.....	2,233.10	3,092.12
		<u>\$809,612.80</u>

Moneys paid out of income for real and personal property for year ending December 31, 1918:

The Rockefeller Foundation:

Furniture and fixtures.....	\$2,876.59	
Books for the library.....	218.90	
Grand Chenier Tract, taxes, etc..	7,871.71	
	<u>10,967.20</u>	

China Medical Board:

Peking Union Medical College:

Purchase of additional property .	\$3,262.21	
Buildings and fixed equipment	1,575,708.43	
Library.....	10,436.34	
Accessories.....	10,231.59	
Improvements and alterations	18,264.75	
Movable equipment	1,762.54	
	<u>1,619,665.86</u>	

Shanghai Medical School:

Buildings and fixed equipment	16,848.08	
Library.....	190.35	
Accessories.....	30.10	
	<u>17,068.53</u>	

Purchase of land in China.....

56,358.15 1,693,092.54 1,704,059.74

Total Fund Carried Forward.. \$2,513,672.54

EXHIBIT O—*Continued**Total Fund Brought Forward. . . .*

\$2,513,672.54

This fund is represented by the following property:

The Rockefeller Foundation:

Grand Chenier Tract (land, taxes, fees, etc.)	\$243,365.70	
Furniture and fixtures	11,881.56	
Library—New York City	1,394.97	
	<hr/>	\$256,642.23

China Medical Board:

Peking Union Medical College:

Original purchase	\$178,772.77	
Additional Land	167,685.20	
Buildings and fixed equipment	1,575,708.43	
Library	14,469.38	
Movable equipment	1,762.54	
Improvements and alterations	18,264.75	
Accessories	10,231.59	
	<hr/>	1,966,894.66

Shanghai Medical School:

Buildings and fixed equipment	16,848.08		
Library	370.21		
Accessories	30.10		
	<hr/>	17,248.39	
Harvard Medical School	28,800.00		
Purchase of land in China	243,469.15		
Equipment—New York	618.11	2,257,030.31	
	<hr/>	<hr/>	
		\$2,513,672.54	\$2,513,672.54
		<hr/>	<hr/>

EXHIBIT P

TRANSACTIONS RELATING TO INVESTED FUNDS

GENERAL FUND

SECURITIES SOLD AND REDEEMED

NAME	RATE %	TOTAL PROCEEDS	
\$500,000. Chicago & Northwestern Ry., participation in loan maturing July 24th, 1918.	6	\$500,000.00	
500,000. Do. maturing October 22nd, 1918.	6	500,000.00	
716,000. Euclid Heights Realty Co. bonds: Distribution of \$26.00 per bond in, liquidation of assets, added to Reserve.			\$18,616.00 Gain
36,000. New York Central Lines Equipment.	4½	36,000.00	345.85
700,000. United Kingdom of Great Britain & Ireland Two-year Notes.	5	700,000.00	3,937.50
1,400,000. United States Government Certificates of Indebtedness maturing May 28th, 1918.	4½	1,400,000.00	
2,100,000. Do. maturing June 18th, 1918.	4½	2,100,000.00	
2,700,000. Do. maturing July 9th, 1918.	4½	2,700,000.00	
500,000. Do. maturing July 18th, 1918.	4½	500,000.00	
700,000. Do. maturing October 24th, 1918.	4½	700,000.00	
1,500,000. Do. maturing October 24th, 1918, exchanged for Liberty Bonds as shown in following table.	4½	1,500,000.00	
500,000. Do. maturing January 2nd, 1919.	4½	500,000.00	
224,700. United States First Liberty Loan.	3½	224,430.36	89.88 Loss
50,000. Wheeling & Lake Erie R.R. Equipment.	5	50,000.00	125.00 Gain
<i>Carried Forward.</i>		\$11,429,046.36	\$22,934.47

EXHIBIT P (Continued)

TRANSACTIONS RELATING TO INVESTED FUNDS

GENERAL FUND		
NAME	RATE %	TOTAL PROCEEDS
SECURITIES SOLD AND REDEEMED		
<i>Brought Forward</i>		
220 Shares Chehalis & Pacific Land Co.: Dividends amounting to \$3.83 per share, in liquidation, credited to cost of stock.....		\$11,429,046.36
619 Shares Colonial Oil Co. Capital Stock: Final dividend (31%) in liquidation of Company's assets, added to Reserve.....		842.60
20,000 Shares Galena-Signal Oil Co. Common Stock: Right to purchase 4,000 shares new preferred stock sold and proceeds credited to cost of stock.....		19,189.00
4,193 Shares Galena-Signal Oil Co. Preferred Stock: Right to purchase 838-3/5 shares new preferred stock sold and proceeds credited to cost of stock.....	Gain	5,936.69
		1,244.63
	Gain	\$11,456,259.28
		\$42,123.47
SECURITIES GIVEN AWAY		
\$1,500,000. United States Fourth Liberty Loan given to American Red Cross on account of an appropriation.....	4½	\$1,500,000.00
1,000,000. United States Third Liberty Loan given to United War Work Campaign on account of an appropriation.....	4½	1,000,000.00

SECURITIES BOUGHT, RECEIVED THROUGH EXCHANGE, ETC.

	NAME	RATE %	COST	PRICE %
\$500,000.	Chicago & Northwestern Ry. participation in loan, maturing July 24th, 1918.	6	\$500,000.00	100.
500,000.	Do. maturing October 22nd, 1918.	6	500,000.00	100.
500,000.	Do. maturing January 22nd, 1919.	6	500,000.00	100.
1,400,000.	United States Certificates of Indebtedness due May 28th, 1918.	4½	1,400,000.00	100.
2,100,000.	Do. maturing June 18th, 1918.	4½	2,100,000.00	100.
2,700,000.	Do. maturing July 9th, 1918.	4½	2,700,000.00	100.
500,000.	Do. maturing July 18th, 1918.	4½	500,000.00	100.
2,200,000.	Do. maturing October 24th, 1918.	4½	2,200,000.00	100.
500,000.	Do. maturing January 2nd, 1919.	4½	500,000.00	100.
224,700.	United States First Liberty Loan, received as dividends from American Shipbuilding Co.	3½	224,520.24	99.919
1,500,000.	United States Fourth Liberty Loan, received in exchange for \$1,500,000 United States Government Certificates of Indebtedness, 4½.	4½	1,500,000.00	100.
			<u>\$12,624,520.24</u>	
\$1,000,000.	United States Third Liberty Loan, received from Mr. John D. Rockefeller.	4½	\$1,000,000.00	100.

SECURITIES RECEIVED AS A GIFT

United States Third Liberty Loan, received from Mr. John D. Rockefeller.

HENRY STURGIS GREW MEMORIAL FUND

SECURITIES BOUGHT

25,850.	United States Second Liberty Loan.....	4	\$25,000.00	96.711
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SECURITIES DELIVERED FOR EXCHANGE

25,850.	United States Second Liberty Loan.....	4	\$25,000.00
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SECURITIES RECEIVED THROUGH EXCHANGE

25,850.	United States Second Liberty Loan Converted.....	4½	\$25,000.00
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EXHIBIT Q

SCHEDULE OF SECURITIES IN GENERAL FUNDS ON DECEMBER 31, 1918, REPRESENTING
BOTH PRINCIPAL AND INCOME TEMPORARILY INVESTED

BONDS

NAME	INTEREST RATE PER CENT.	DATE OF MATURITY	AMOUNT	PRICE PER CENT.	CASH PRICE
American Agricultural Chemical Co. First Mortgage Convertible.....	5	Oct. 1928	\$485,000	101.	\$489,850.00
American Telephone & Telegraph Co. Thirty-Year Collateral Trust.....	5	Dec. 1946	100,000	97.75	97,750.00
Anglo-French External Loan.....	5	Oct. 15 '20	600,000	96.0862	576,517.20
Armour & Co. Real Estate First Mortgage.....	4½	June 1939	1,000,000	93.25	932,500.00
Ashland Power Co. First Mortgage.....	5	Mar. 1928	8,000	100.	8,000.00
Atlantic & Birmingham Ry. First Mortgage.....	5	Jan. 1934	677,000	90.	609,300.00
Baltimore & Ohio R.R. Refunding and General Mort- gage.....	5	Dec. 1995	650,000	99.75	648,375.00
Bethlehem Steel Co. Two-Year Secured Notes.....	5	Feb. 15 '19	1,000,000	98.25	982,500.00
Chicago & Alton R.R. Refunding Mortgage.....	3	Oct. 1949	551,000	65.	358,150.00
Chicago & Alton Ry. First Lien.....	3½	July 1950	854,000	53.	452,620.00
Chicago City & Connecting Railways Collateral Trust	5	Jan. 1927	1,305,000	85.	1,100,250.00
Chicago & Eastern Illinois R.R. Refunding and Im- provement Mortgage.....	4	July 1955	300,000	63.	189,000.00
Chicago, Milwaukee & St. Paul Ry. General Mort- gage Series "A".....	4	May 1989	30,000	97.	29,100.00

EXHIBIT Q—Continued
SCHEDULE OF SECURITIES—Continued
BONDS

NAME	INTEREST RATE PER CENT.	DATE OF MATURITY	AMOUNT	PRICE PER CENT.	CASH PRICE
Chicago, Milwaukee & St. Paul Ry. General Mortgage Series "C".....	4½	May 1939	500,000	103.	\$515,000.00
Chicago, Milwaukee & St. Paul Ry. Debenture.....	4	July 1934	450,000	88.2838	397,277.50
Chicago, Milwaukee & St. Paul Ry. General and Refunding Mortgage Series "A".....	4½	Jan. 2014	500,000	91.0625	455,312.50
Chicago & North Western Ry. Extension.....	4	Aug. 15'26	50,000	95.	47,500.00
Chicago & North Western Ry. Sinking Fund Debenture.....					
Chicago & North Western Ry. Secured Loan.....	5	May 1933	80,000	102.	81,600.00
Chicago Railways Co. First Mortgage.....	6	Jan. 24'19	500,000	100.	500,000.00
Cleveland, Cincinnati, Chicago & St. Louis Ry. St. Louis Division, Collateral Trust.....	5	Feb. 1927	500,000	97.	485,000.00
Cleveland, Cincinnati, Chicago & St. Louis Ry. General.....	4	Nov. 1990	73,000	90.	65,700.00
Cleveland Short Line First Mortgage.....	4	June 1993	700,000	83.893	587,250.00
Colorado Industrial Co. First Mortgage.....	4½	Apr. 1961	500,000	95.	475,000.00
Consolidated Gas Co. (New York) Convertible Debenture.....	5	Aug. 1934	2,000,000	80.	1,600,000.00
Dominion of Canada, Government of, Fifteen-Year.	6	Feb. 1920	500,000	110.	550,000.00
Erie R.R. General Mortgage Convertible Fifty-Year Series "B".....	5	Apr. 1931	500,000	94.565	472,825.00
	4	Apr. 1953	1,065,000	74.7175	795,742.30

Illinois Central R.R. Refunding Mortgage.....	4	Nov. 1955	\$300,000	87.	\$261,000.00
Interborough Rapid Transit Co. First Mortgage.....	5	Jan. 1966	1,750,000	96.8571	1,695,000.00
International Mercantile Marine Co. First and Col- lateral Trust Sinking Fund.....	6	Oct. 1941	2,848,290	97.5	2,777,082.75
Lake Erie & Western R.R. Second Mortgage.....	5	July 1941	100,000	100.	100,000.00
Lake Shore & Michigan Southern Ry. First Mortgage	3½	June 1997	926,000	87.	805,620.00
Lake Shore & Michigan Southern Ry. Debenture...	4	May 1931	1,673,000	92.	1,539,160.00
Magnolia Petroleum Co. First Mortgage.....	6	Jan. 1937	1,809,000	100.	1,809,000.00
Missouri, Kansas & Texas Ry. General Mortgage Sinking Fund.....	4½	Jan. 1936	1,325,000	84.	1,113,000.00
Morris & Essex R.R. First and Refunding Mortgage...	3½	Dec. 2000	175,000	82.75	144,812.50
Mutual Fuel Gas Co. First Mortgage.....	5	Nov. 1947	250,000	100.	250,000.00
National Railways of Mexico, Prior Lien Fifty-Year Sinking Fund with January 1915 and subsequent coupons attached.....	4½	July 1957	50,000	59.	29,500.00
Secured 6% Notes for coupon due January 1, 1914		Jan. 1917	1,125	59.	663.75
Guaranty Trust Co. Receipt for July 1, 1914 coupon			1,125	59.	663.75
New Orleans, Texas & Mexico Ry. Non Cumulative Income Series "A".....	5	Oct. 1935	180,000	42.	75,600.00
New York Central Lines Equipment Trust of 1913....	4½	Jan. '19-'28	360,000	99.039	356,541.51
New York Central & Hudson River R.R. Thirty-Year Debenture.....	4	May 1934	330,000	88.45	291,885.00
New York, Chicago & St. Louis R.R. First Mortgage	4	Oct. 1937	35,000	95.	33,250.00
New York, Chicago & St. Louis R.R. Debenture.....	4	May 1931	1,303,000	87.	1,133,610.00
New York City Corporate Stock.....	4½	Mar. 1964	100,000	94.5	94,500.00
New York Connecting R.R. First Mortgage.....	4½	Aug. 1953	500,000	95.69073	478,453.65
Northern Pacific Ry. Refunding and Improvement Mortgage.....	4½	July 2047	390,000	91.577	357,150.00
Pennsylvania R.R. Consolidated Mortgage Sterling...	4	May 1948	£2,400	99.	11,880.00

EXHIBIT Q—Continued
SCHEDULE OF SECURITIES—Continued
BONDS

NAME	INTEREST RATE PER CENT.	DATE OF MATURITY	AMOUNT	PRICE PER CENT.	CASH PRICE
Pennsylvania R.R. General Mortgage.....	4½	June 1965	\$1,500,000	98.25	\$1,473,750.00
Philadelphia Co. Convertible Debenture.....	5	May 1922	1,000,000	97.	970,000.00
Philadelphia Co. Convertible Debenture.....	5	Aug. 1919	500,000	95.	475,000.00
Pittsburg, Cincinnati, Chicago & St. Louis Ry. Consolidated Mortgage Series "I".....	4½	Aug. 1963	500,000	103.	515,000.00
Province of Quebec Five-Year.....	5	Apr. 1920	500,000	99.75	498,750.00
Reading Co.—Philadelphia & Reading Coal & Iron Co. General Mortgage.....	4	Jan. 1997	500,000	94.25	471,250.00
Rutland R.R. First Consolidated Mortgage.....	4½	July 1941	25,000	90.	22,500.00
St. Louis-San Francisco Ry. Prior Lien Series "A".....	4	July 1950	1,500,000	72.75	1,091,250.00
St. Louis-San Francisco Ry. Adjustment Mortgage.	6	July 1955	500,000	81.975	409,875.00
Seaboard Air Line Ry. Adjustment Mortgage.....	5	Oct. 1949	455,000	77.	350,350.00
Southern Pacific R.R. First and Refunding Mortgage	4	Jan. 1955	100,000	86.	86,000.00
Sunday Creek Co. Collateral Trust.....	5	July 1944	81,000	78.	63,180.00
United Kingdom of Great Britain & Ireland Three-Year Notes.....	5½	Nov. 1919	350,000	99.125	346,937.50
United Kingdom of Great Britain & Ireland Five-Year Notes.....	5½	Nov. 1921	350,000	98.375	344,312.50
Wabash R.R. Second Mortgage.....	5	Feb. 1939	120,000	97.8	117,360.00
Washington Ry. & Electric Co. Consolidated Mortgage.....	4	Dec. 1951	450,000	83.5	375,750.00
Western Maryland R.R. First Mortgage.....	4	Oct. 1952	1,032,000	78.8913	814,158.76
Wheeling & Lake Erie R.R. Lake Erie Division First Mortgage.....	5	Oct. 1926	140,000	100.	140,000.00
Wheeling & Lake Erie R.R. Equipment Trust Series "B".....	5	Apr. '19-'27	450,000	99.75	448,875.00
TOTAL BONDS.....					\$35,883,791.17

STOCKS

NAME	DIVIDEND RATE PER CENT.	NUMBER OF SHARES	PRICE PER SHARE	CASH PRICE
American Ship Building Co. Preferred.....	7	9,303	85.	\$790,755.00
American Ship Building Co. Common.....	7	14,982	35.	524,370.00
Atchison, Topeka & Santa Fe Ry. Preferred.....	5	5,000	98.25	491,250.00
Atchison, Topeka & Santa Fe Ry. Common.....	6	21,100	95.2563	2,009,908.33
Borné-Serymser Co. Capital.....	20	300	295.	88,500.00
The Buckeye Pipe Line Co. Capital (Par \$50).....	16	49,693	160.	7,950,880.00
Central Nat'l Bank of Cleveland Capital.....	10	500	159.2222	79,611.10
Chehalis & Pacific Land Co. Capital.....	14	220	41.6241	9,157.40
Chesebrough Manufacturing Co. Consolidated Capital.....		2,070	223.333	462,300.00
Chicago City & Connecting Ry. Participation Certificates Preferred.....		17,530	69.1875	1,212,856.88
Chicago City & Connecting Ry. Participation Certificates Common.....		10,518	30.	315,540.00
Cleveland Arcade Co. Capital.....	8	2,500	98.6222	246,555.56
Cleveland Trust Co. Capital.....	10	286	238.195	68,123.77
Colorado & Southern Ry. First Preferred.....	4	7,000	54.	378,000.00
Consolidated Gas Co. of N. Y. Capital.....	7	20,000	127.50	2,550,000.00
The Continental Oil Co. Capital.....	12	7,000	190.	1,330,000.00
Wm. Cramp & Sons Ship & Engine Building Co. Capital.....	3	648	15.	9,720.00

EXHIBIT Q—Continued
SCHEDULE OF SECURITIES—Continued
STOCKS

NAME	DIVIDEND RATE PER CENT.	NUMBER OF SHARES	PRICE PER SHARE	CASH PRICE
The Crescent Pipe Line Co. Capital (Par \$50)	6	14,120	60.	\$847,200.00
Cumberland Pipe Line Co. Capital	10	3,000	81.333	244,000.00
Erie R.R. First Preferred		21,400	45.8306	980,773.76
Eureka Pipe Line Co. Capital	24	12,357	361.3331	4,464,935.59
Galena-Signal Oil Co. Preferred	8	4,193	139.7	585,779.50
Galena-Signal Oil Co. Common		20,000	189.7031	3,794,059.59
Great Lakes Towing Co. Preferred	7	1,527	88.7361	135,500.05
Great Lakes Towing Co. Common	5	1,200	12.	14,400.00
Indiana Pipe Line Co. Capital (Par \$50)	20	24,845	125.111	3,108,385.28
International Agricultural Corporation Preferred	5	6,545	30.	196,350.00
International Agricultural Corporation Common		8,175	5.	40,875.00
Manhattan Ry. Capital	7	10,000	128.775	1,287,750.00
Missouri Pacific R. R. Voting Trust Certificates for Convertible Preferred				
National Lead Co. Preferred	7	21,980	55.	1,219,890.00
National Lead Co. Common		1,100	104.	114,400.00
National Transit Co. Capital (Par \$12.50)	4	29,400	50.	1,470,000.00
New Orleans, Texas & Mexico Ry. Capital	8	126,481	28.5	3,604,708.50
New York, Chic. & St. Louis R.R. Second Preferred		1,125	16.	18,000.00
New York, Chic. & St. Louis R.R. Common	4	400	78.70	31,480.00
New York Transit Co. Capital		100	55.	5,500.00
Northern Pacific Ry. Common	24	12,392	300.	3,717,600.00
Northern Pipe Line Co. Capital	7	700	91.7625	64,233.75
Otis Steel Co. Preferred	10	9,000	110.	990,000.00
Otis Steel Co. Common	7	140	90.	12,600.00
Pere Marquette Ry. Preferred	10	329	20.	6,580.00
Provident Loan Society Certificates (Par \$5,000)		5,740.8	54.56	313,248.00
Seaboard Air Line Ry. Preferred	6	40	100.	200,000.00
		4,300	54.	232,200.00
		3,400	21.	71,400.00

Sheffield Farms Co., Incorporated, Preferred.....	6	150	99.4	\$14,910.00
The Solar Refining Co. Capital.....	10	4,964	185.007	918,375.00
Southern Pipe Line Co. Capital.....	24	24,845	229.5556	5,703,308.88
South West Pennsylvania Pipe Lines Capital.....	12	8,000	160.	1,280,000.00
Standard Oil Co. (Indiana) Capital.....	24	29,718	867.	25,765,506.00
The Standard Oil Co. (Kansas) Capital.....	24	4,966	275.016	1,365,733.13
Standard Oil Co. (Kentucky) Capital.....	12	14,868	70.2547	1,044,547.23
Standard Oil Co. (Nebraska) Capital.....	20	2,482	270.	670,140.00
The Standard Oil Co. (Ohio) Capital.....	16	17,392	210.	3,652,320.00
Superior Savings & Trust Co. Capital.....	12	300	297.6333	89,350.00
Tilden Iron Mining Co. Capital.....	5½	1,780	27.35	48,683.46
Union Tank Line Co. Capital.....	5	24,000	70.	1,680,000.00
U.S. Cast Iron Pipe & Foundry Co. Preferred.....	5	1,987	44.444	88,310.89
Washington Oil Co. Capital (Par \$10).....	40	1,774	30.	53,220.00
Western Maryland Ry. Second Preferred.....		500	46.	23,000.00
Western Pacific R.R. Corporation Preferred.....	6	20,195	43.5	878,482.50
Western Pacific R.R. Corporation Common.....		30,292½	15.25	461,960.62
Wilson Realty Co. Capital.....		591	100.	59,100.00
Woman's Hotel Co. Capital.....		300	80.	24,000.00
TOTAL STOCKS.....				\$90,110,384.77

EXHIBIT Q—Continued
SCHEDULE OF SECURITIES—Continued

SUMMARY

Bonds.....	\$35,883,791.17
Stocks.....	90,110,384.77
	<hr/>
Total book value of investments belonging to General Funds, principal and income.....	\$125,994,175.94
	<hr/>
The foregoing investments are apportioned as follows:	
General Fund.....	\$120,765,856.00
General Fund Income.....	3,817,550.62
Estate Laura S. Rockefeller Fund.....	152,733.00
Reserve.....	1,258,036.32
	<hr/>
TOTAL.....	\$125,994,175.94
	<hr/>

EXHIBIT R
SCHEDULE OF SECURITIES IN SPECIAL FUNDS ON DECEMBER 31, 1918
JOHN D. ROCKEFELLER FUND
BONDS

NAME	RATE %	DATE OF MATURITY	AMOUNT	PRICE %	CASH PRICE
Canada Southern Ry. Consolidated Mortgage Series "A"	5	Oct. 1932	\$37,000	100.	\$37,000.00

LAURA S. ROCKEFELLER FUND

BONDS

Colorado Industrial Co. First Mortgage.....	5	Aug. 1934	\$50,000	80.	\$40,000.00
Virginia Carolina Chemical Co. First Mortgage	5	Dec. 1923	10,000	93.	9,300.00

HENRY STURGIS GREW MEMORIAL FUND

BONDS

United States Second Liberty Loan Converted.....	4½	Nov. 15'42	\$25,850	96.71167	\$25,000.00
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INDEX

	PAGE
<i>A. Cruzians</i> Wiedermann (Mosquito).....	186
<i>A. Punctipennis</i> Say (Mosquito).....	186
<i>A. Quadrimaculatis</i> Say (Mosquito).....	186
ALABAMA:	
Relief and control of hookworm disease.....	91
ALVARADO, COSTA RICA:	
Average hemoglobin index.....	56
AMERICAN ACADEMY IN ROME.....	70
AMERICAN RED CROSS:	
Co-operation with Commission for Prevention of Tuberculosis in France.....	23-24, 79, 102, 201-202, 205-206
Appropriations by Rockefeller Foundation.....	52-53, 56
<i>See also</i> Camp and Community Welfare Work; Commission for Prevention of Tuberculosis in France.	
AMERICAN SOCIAL HYGIENE ASSOCIATION:	
Policy of Rockefeller Foundation.....	53
<i>See also</i> Camp and Community Welfare Work.	
ANCYLOSTOME:	
Comparative virulence of different species.....	120
Comparative resistance to treatment.....	141
ANEMIA:	
Causes and prevalence.....	119-120
Associated with hookworm infection and other conditions.....	121-122
<i>See also</i> Hemoglobin; Hookworm Disease, Diagnosis; Malaria.	
ANKING, CHINA, <i>see</i> ST. JAMES HOSPITAL, ANKING.	
ANKYLOSTOME, <i>see</i> ANCYLOSTOME.	
ANKYLOSTOMIASIS, <i>see</i> HOOKWORM DISEASE; UNCINARIASIS COM- MISSION TO THE ORIENT.	
ANNUAL FOREIGN MISSIONS CONFERENCE OF NORTH AMERICA, <i>see</i> COMMITTEE ON REFERENCE AND COUNSEL OF ANNUAL FOREIGN MISSIONS CONFERENCE OF NORTH AMERICA.	
<i>Anopheles</i> (Mosquito).....	31, 186, 192, 193, 194
ANTHELMINTIC, <i>see</i> HOOKWORM DISEASE, DIAGNOSIS; NAMES OF DRUGS.	
ANTI-DYSENTERIC SERUM.....	275, 277
ANTI-GASEOUS GANGRENE SERUM.....	278-279
ANTI-MOSQUITO MEASURES, <i>see</i> MALARIA CONTROL.	

	PAGE
ANTI-PNEUMOCOCCUS SERUM.....	276-278
ANTI-TUBERCULOSIS DISPENSARIES, <i>see</i> DISPENSARIES.	
AQUIARES, COSTA RICA:	
Percentage of re-infection.....	154
ARIZONA:	
Hookworm infection among army recruits.....	119
ARKANSAS, HOOKWORM DISEASE IN:	
Relief and control.....	91
Data on infection in dust.....	159
<i>See also</i> Malaria Control.	
ARMENIAN AND SYRIAN RELIEF.....	55, 56
ARMITAGE, J. AURIOL:	
Member Board of Trustees, Peking Union Medical College, 1918, 1919.....	224, 225, 226, 227
ASCARIS (INTESTINAL PARASITE).....	158
ASSAM:	
Hookworm infection in tea gardens.....	112
ATIBAIA, BRAZIL, HOOKWORM DISEASE IN:	
Tests in efficacy of oil of chenopodium in treatment.....	142
Intensive operations for control begun.....	151
AUSTRALIA, HOOKWORM DISEASE IN:	
Enlarged control programs by local agencies.....	82
Appropriation for health service and extension of program in Papua.....	101
Commonwealth government in co-operation with states for rural sanitation.....	101-102
Infection among aborigines.....	114
<i>See also</i> Names of places.	
AYERS, DR. T. W.....	254
AYUTLA, GUATEMALA.....	86
AZEVEDO, PAEZ:	
Associate State Director for Brazil.....	77
BACILLI, VIABILITY, <i>see</i> NAMES OF DISEASES.	
<i>Bacteriological Study of Yellow Fever</i> , by Dr. Hideyo Noguchi..	84
BAHIA (STATE) BRAZIL:	
Infection survey authorized.....	148
Compulsory erection of latrines.....	170
BAILEY, DR. C. A.:	
State Director for Salvador, International Health Board....	78
BARBADOS, HOOKWORM DISEASE IN:	
Request for assistance in control.....	92
Erection of latrines prerequisite to work for control.....	97, 170

BARBER, DR. M. A.:	
Development of glycerine-salt method of hookworm diagnosis	132
Development of brine-flotation method of hookworm diagnosis	136
<i>Treatment of Hookworm Infection</i>	140
Also.....	143
BARCHET, HARRIET.....	244
BARNES, DR. M. E.:	
State Director for Siam, International Health Board.....	78
BARTON, JAMES L.:	
Vice-Chairman Board of Trustees, Peking Union Medical College.....	224
Member Board of Trustees, Peking Union Medical College, 1918, 1919.....	224, 225, 226, 227
BASS, DR. C. C.:	
Scientific Director Malaria Work.....	78
Also.....	139
BATAVIA, JAVA:	
Hemoglobin index among prisoners.....	120
BAUXITE, ARKANSAS, <i>see</i> ANTI-MOSQUITO MEASURES, <i>under</i> MALARIA CONTROL.	
BAXTER, DR. DONALD E.:	
Superintendent, Peking Union Medical College.....	243
BEATY, MARY L.....	246
BELAIR, ST. VINCENT.....	154
BELGIAN RELIEF COMMISSION, <i>see</i> COMMISSION FOR RELIEF IN BELGIUM.	
BELGIUM:	
Reduction in hookworm infection in mines.....	153
BELLE VUE DISTRICT, BRITISH GUIANA.....	124
BENGAL, HOOKWORM DISEASE IN:	
Work for control.....	91-92
Infection in jails.....	112-113
BENNETT, B. FRANK.....	235
BETA-NAPHTHOL:	
In treatment of hookworm disease.....	138
BIGGS, DR. HERMANN M.	
Member International Health Board, 1918, 1919.....	67, 76
BINET-SIMON TEST:	
On soldiers at Camp Travis.....	93
On school children in Queensland.....	129
BIRTH RATE:	
Affected by hookworm infection.....	127
<i>See also</i> Pregnancy.	

BLACK, DAVIDSON:	
Professor of Embryology and Neurology, Peking Union Medical College.....	239
BLIGNY, FRANCE:	
Equipment of sanatorium and per capita cost of maintenance, 21-22	
BLOOD, <i>see</i> HEMOGLOBIN.	
BOGAWANTALAWA, CEYLON.....	155, 156, 164
BOLIVAR COUNTY, MISSISSIPPI, <i>see</i> TREATMENT OF CARRIERS,	
<i>under</i> MALARIA CONTROL.	
BORDEAUX, FRANCE.....	26, 206
BORING, ALICE M.:	
Assistant in Biology, Pre-Medical School, Peking Union Medical College.....	245
BOYD, DR. H. W.....	254
BRAZIL, DR. VITAL:	
Member Brazilian Advisory Committee.....	79
BRAZIL, HOOKWORM DISEASE IN:	
Co-operation of International Health Board in survey of rural health problems.....	40
Enlarged programs by local agencies.....	82
Relief and control.....	91
Appropriation by government for rural sanitation.....	97
Erection of latrines prerequisite to work for control.....	97, 170
Percentage of hookworm infection and other intestinal parasites.....	113
Value and results of worm counts.....	114, 117, 151
Comparative infection among agriculturists and townspeople.....	118-119
Comparative results in methods of diagnosis.....	132
Establishment of average efficiency of dosage of oil of chenopodium.....	140
Modified intensive plan for control.....	163-164
Also.....	39, 41, 44
<i>See also</i> Names of places.	
BRAZILIAN ADVISORY COMMITTEE:	
Personnel.....	79
BRINE FLOTATION-LOOP METHOD, <i>see</i> HOOKWORM DISEASE, DIAGNOSIS.	
BRITISH GUIANA, HOOKWORM DISEASE IN:	
Relief and control.....	91
Economic effect among laborers.....	95
Effect of sanitary reform on hospital in Georgetown.....	124
Use of oil of chenopodium as anthelmintic.....	139

	PAGE
BRITISH GUIANA, HOOKWORM DISEASE IN—<i>Continued:</i>	
Investigations on viability of hookworm larvae.....	159
Erection of latrines prerequisite to work for control.....	170
<i>See also</i> Belle Vue District; Georgetown; Peter's Hall District.	
BRITLAND, A. J. D.:	
Pharmacist, Peking Union Medical College.....	243
BROCKMAN, FLETCHER S.:	
Shanghai Medical School:	
Member Board of Trustees, 1918, 1919.....	228, 229
Member Executive Committee, Board of Trustees, 1919 ..	229
BROWN, ARTHUR J.:	
Peking Union Medical College:	
Member Executive Committee and Member Board of Trustees, 1918, 1919.....	224, 225, 226, 227
Vice-Chairman Board of Trustees, 1919.....	226
BROWN, FLORENCE B.....	246
BROWN, DR. N. WORTH.....	254
BUREAU OF MUNICIPAL RESEARCH, NEW YORK CITY.....	71
BURRES, DR. W. T.:	
State Director for Panama, International Health Board.....	78
BUTTRICK, DR. WALLACE:	
Rockefeller Foundation:	
Member Executive Committee and Member, 1918, 1919.	12, 13, 65, 66
International Health Board:	
Member.....	67, 76
China Medical Board:	
Member.....	67
General Director.....	67, 222
Member and Member Executive Committee, 1918, 1919.	222-223
Secretary Board of Trustees, Peking Union Medical College,	224
Member Executive Committee and Member Board of Trustees, Peking Union Medical College, 1918, 1919.	224, 226
Secretary Board of Trustees, Shanghai Medical School....	228
Member Executive Committee and Member Board of Trustees, Shanghai Medical School, 1918, 1919.....	228, 229
Resignation as Director.....	260
CAIRNS, QUEENSLAND.....	173
CAIRNS-SHIRE, QUEENSLAND.....	173
CALCUTTA:	
Hookworm infection in jails.....	113

CALIFORNIA:

Investigations on viability of hookworm larvae..... 158

CALLIAQUA, ST. VINCENT..... 154

CAMP AND COMMUNITY WELFARE WORK:

Policy of Rockefeller Foundation..... 53

List of organizations with tables showing expenditures by
Rockefeller Foundation, 1914-1918, and appropriations
for 1919.....54, 69

CAMP BOWIE, TEXAS:

Hookworm infection among soldiers..... 123

CAMP JACKSON, SOUTH CAROLINA:

Hookworm infection among soldiers..... 119

CAMP TRAVIS, TEXAS:

Lowered mentality in soldiers caused by hookworm disease.93, 128

CANNON, DR. WALTER B.:

Member Board of Trustees, Shanghai Medical School 228

CARONI AREA, TRINIDAD..... 167

CARR, JO..... 246

CARREL, DR. ALEXIS269, 279-280

CARREL-DAKIN TREATMENT OF WOUNDS..... 270

CARRIERS OF DISEASE, *see* MALARIA CONTROL.

CARVACROL:

In treatment of hookworm disease..... 138

CASTOR OIL:

In treatment of hookworm disease..... 145

CAULFIELD, KATHLEEN..... 246

CAYMAN ISLANDS, JAMAICA:

Results of infection survey of 1917..... 148

CENTRAL AMERICA:

Relief and control of hookworm disease..... 91

Obstacles to construction of latrines..... 181

See also Yellow Fever Commission to Central America;

Names of places.

CENTRIFUGE, *see* HOOKWORM DISEASE, DIAGNOSIS.

CEYLON, HOOKWORM DISEASE IN:

Progress in control.....38-39

Enlarged programs by local agencies..... 82

Relief and control..... 91

Rate of infection.....94, 112

Effect on influenza.....94, 123

Erection of latrines prerequisite to work for control..... 97

Fewer hospital admissions as result of treatment..... 124

Dosage of oil of chenopodium in treatment.....140, 144

CEYLON, HOOKWORM DISEASE IN—*Continued*:

Chenopodium-Croton oil in treatment.....	143
Percentage of re-infection.....	155-156
Modified intensive plan for control.....	163
Post-campaign measures.....	164-165
Government regulations regarding latrines, and results.....	170
	173, 174

See also Bogawantalawa, Ceylon.

CHAGAS, DR. CARLOS:

Chairman Brazilian Advisory Committee.....	79
--	----

CHANG, DR. C. H.:

Clinical Assistant in Surgery, Peking Union Medical College	244
---	-----

CHAR, DR. GEORGE Y..... 246

CHATEAUDUN, FRANCE..... 25

CHEER, SHEO-NAN..... 258

Chemical Study of Yellow Fever, by H. E. Redenbaugh..... 84CHENOPODIUM, *see* OIL OF CHENOPODIUM.

CHENOPODIUM-CROTON OIL:

In treatment for hookworm disease.....	143
--	-----

CHICOT COUNTY, ARKANSAS, *see* LAKE VILLAGE, *under* MALARIA CONTROL.CHICOT LAKE, ARKANSAS, *see* LAKE VILLAGE, *under* MALARIA CONTROL.CHIENGMAI, *see* SIAM.

CHILDREN:

Treated for hookworm disease in Rio de Janeiro.....	92, 127
Mental tests in schools in Queensland.....	93, 128, 129
Hookworm infection in schools in Bengal and Brazil.....	113
Hookworm infection on coffee plantations.....	118
Hemoglobin index of hookworm infected boys in Sao Paulo, Brazil.....	118
Varying effect of infection on adults and children.....	121
Effects of sanitary reform on orphanage and boys' reformatory, Trinidad.....	123-124
Effect of hookworm disease on mental development.....	127-128
Dosage of oil of chenopodium and of thymol.....	138, 139, 140
Soil sanitation and reduced death rate in North Carolina..	184-185
Dosage of quinine in malaria control.....	194

CHINA, HOOKWORM DISEASE IN:

Relief and control.....	91
Rate of infection.....	113
Value of worm counts in diagnosis.....	117
Dosage of oil of chenopodium in treatment.....	144-145

CHINA, HOOKWORM DISEASE IN—*Continued*:

Investigations on viability of larvae.....	158
Investigations on infection by flies.....	159
Erection of latrines prerequisite to work for control.....	170
Sanitation in mines and need of government regulations .	175-176
<i>See also</i> Pinghsiang Colliery, China.	

CHINA MEDICAL BOARD:

Aid to schools and hospitals in China, with amount expended	46-47, 70
Officers and members, 1918, 1919.....	222, 223, 260
Progress of construction of Peking Union Medical College,	232-235
Construction work at Shanghai deferred.....	249
Progress of work in medical and pre-medical education .	250-252
Fellowships and scholarships, with names of holders.	254-256, 258
Grants to Nurses' Association of China and to Publication Committee of the China Medical Missionary Association	259-261
<i>See also</i> Names of schools and colleges; Names of persons and places.	

CHINA MEDICAL MISSIONARY ASSOCIATION, PUBLICATION COMMITTEE.....

263

CHLOROFORM:

In treatment of hookworm disease.....	138
---------------------------------------	-----

CHU, HUNG PIH.....	256
--------------------	-----

CH'U, DR. Y. T.:

Resident Surgeon, Peking Union Medical College.....	242
---	-----

<i>Clinical Study of Yellow Fever</i> , by Dr. C. A. Elliott, and <i>Supplementary Report</i> by Dr. M. G. Lebrede.....	84
---	----

COFFEE PLANTATIONS:

Hookworm infection among laborers.....	118, 142
Latrine accommodations.....	167
Also.....	94

COLOMBIA:

Request for assistance in control of hookworm disease.....	92
--	----

COMMISSION FOR PREVENTION OF TUBERCULOSIS IN FRANCE:

Justification.....	20-21
Co-operation with American Red Cross.....	23, 201-202
Systematic educational campaign.....	25
Training and work of <i>Les Visiteuses d'Hygiène</i>	26-27, 205-206
Medicinal tank and other publicity work.....	27-29
Plans for organized systematic extension work.....	29-30
Co-operation of French physicians and local committees....	30-31
Directors.....	79

	PAGE
COMMISSION FOR PREVENTION OF TUBERCULOSIS IN FRANCE	
— <i>Continued</i> :	
Method of work and co-operation with other agencies.....	102
Work and plans of traveling exhibits.....	201
Posters, pamphlets, and press articles.....	201-202
Dispensaries at Eure-et-Loir.....	202, 205
Department of nursing.....	205-206
Amount expended.....	215, 216
COMMISSION FOR RELIEF IN BELGIUM:	
Expenditures by Rockefeller Foundation, 1914-1918, and appropriations for 1919.....	55
Expenditures by Rockefeller Foundation, 1918.....	69
Also.....	60
COMMISSION ON TRAINING CAMP ACTIVITIES, <i>see</i> CAMP AND COMMUNITY WELFARE WORK.	
COMMISSION ON TRAINING CAMP ACTIVITIES, AUXILIARY FUND, <i>see</i> CAMP AND COMMUNITY WELFARE WORK.	
COMMITTEE OF FOURTEEN, NEW YORK CITY, <i>see</i> CAMP AND COMMUNITY WELFARE WORK.	
COMMITTEE ON REFERENCE AND COUNSEL OF ANNUAL FOREIGN MISSIONS CONFERENCE OF NORTH AMERICA.....	
	71
COMMITTEE ON SCIENTIFIC RESEARCH IN GOVERNMENTAL PROB- LEMS.....	
	70
CONNELLY, SUSAN H.....	246
CONNOR, DR. M. E.:	
Director of yellow fever work in Ecuador.....	79, 88
COOKTOWN, QUEENSLAND.....	173
COSTA RICA, HOOKWORM DISEASE IN:	
Relief and control.....	91
Economic effect among laborers.....	94-95
Examinations on degrees of anemia caused by infection....	121
Average hemoglobin index.....	122
Lowest recorded percentage of re-infection.....	154
Increase in number of school and other latrine accommo- dations.....	181
Soil sanitation followed by lower death rate.....	185
<i>See also</i> Names of places.	
COUSLAND, DR. P. B.....	259-260
COUTANT, DR. A. F.:	
Physician in Charge, Hospital Ship for Philippine Islands..	79
COUTANT, MRS. A. F.:	
Bacteriologist, Hospital Ship for Philippine Islands.....	79

COVINGTON, DR. P. W.:	
Senior State Director for Texas, International Health Board	78
COWDRY, DR. E. V.:	
Head Department of Anatomy, Peking Union Medical College	236
CRANDALL, DR. GRACE.....	254
CROSS, DR. C.:	
Associate State Director for Mississippi, International Health Board.....	78
CROSSETT, ARKANSAS, <i>see</i> ANTI-MOSQUITO MEASURES, <i>under</i> MALARIA CONTROL.	
CURACAO, WEST INDIES:	
Request for assistance in control of hookworm disease.....	92
DAKIN, DR. HENRY D.....	269
DARJEELING DISTRICT, INDIA.....	124, 127
DARLING, DR. S. T.:	
Professor of Hygiene and Public Health, School of Hygiene and Public Health, University of Sao Paulo.....	79, 104
<i>Treatment of Hookworm Infection</i>	140
Also.....	note 136, 143
DASHIELL, LEFFERTS M.:	
Assistant Treasurer Rockefeller Foundation, 1918, 1919.12, 13, 65	
DERMOTT, ARKANSAS, <i>see</i> ANTI-MOSQUITO MEASURES, <i>under</i> MALARIA CONTROL.	
DERSHIMER, DR. F. W.:	
State Director for British Guiana, International Health Board	77
Investigations on viability of hookworm larvae.....	159
DICKOYA AREA, CEYLON.....	155, 164
DILLEY, DR. FREDERICK E.:	
Associate in Surgery, Peking Union Medical College.....	240
DISPENSARIES:	
Leon Bourgeois, Paris.....	21
19th Arrondissement, Paris.....	23
Department of Eure-et-Loir.....	23, 24-25, 202, 205
Study in New York City.....	50
Amount expended by International Health Board.....	70
<i>See also</i> Commission for Prevention of Tuberculosis in France; Names of places.	
DOCK, DR. GEORGE.....	139
DREUX, FRANCE.....	25
DRUGS:	
Method of determining efficiency.....	147
<i>See also</i> Names of drugs.	

	PAGE
DUNLAP, DR. ALBERT M.:	
Associate Professor of Otology, Rhinology, and Laryngology, Peking Union Medical College.....	239
Also.....	254
DUST, <i>see</i> HOOKWORM LARVAE, VIABILITY.	
DUTCH GUIANA:	
Average hemoglobin index.....	122
Code of sanitary laws.....	178
DYSENTERY.....	43, 184
<i>See also</i> Anti-dysenteric Serum.	
DYSENTERY BACILLI, VIABILITY.....	168, 169
 EAST, THE:	
Relief and control of hookworm disease.....	91
<i>See also</i> Uncinariasis Commission to the Orient; Names of countries.	
ECUADOR, <i>see</i> GUAYAQUIL.	
ELLIOTT, DR. C. A.:	
Member Yellow Fever Commission to Ecuador.....	78, 84
<i>A Clinical Study of Yellow Fever, with Supplementary Report</i> by Dr. M. G. Lebrede.....	84
ELPITIYA AREA, CEYLON.....	155
EMBREE, EDWIN R.:	
Rockefeller Foundation:	
Secretary, 1918, 1919.....	12, 13, 65, 67
Secretary Executive Committee, 1918, 1919.....	12, 13, 66
International Health Board:	
Secretary.....	67, 76
China Medical Board:	
Secretary, 1918, 1919.....	67, 222, 223, 260
Secretary Board of Trustees, Peking Union Medical Col- lege, 1919.....	226, 260
Secretary Board of Trustees, Shanghai Medical School, 1919.....	229, 260
EMBREY, HARTLEY C.:	
Associate in Physiological Chemistry, Peking Union Medical College.....	240
ESCUINTLA, GUATEMALA.....	86
EUCALYPTUS:	
In treatment of hookworm disease.....	138
EURE-ET-LOIR, FRANCE, <i>see</i> DISPENSARIES.	

	PAGE
FACULDADE DE MEDICINA E CIRURGIA, <i>see</i> UNIVERSITY OF SAO PAULO, BRAZIL—DEPARTMENT OF HYGIENE.	
FAN, YUAN-LIEN.....	260
FARRAND, DR. LIVINGSTON:	
Director of Commission for Prevention of Tuberculosis in France.....	67, 79
Also.....	21
FAUST, ERNEST C.:	
Associate in Parasitology, Peking Union Medical College..	240
FECES, <i>see</i> HOOKWORM LARVAE, VIABILITY; LATRINES.	
FECES, EXAMINATION OF, <i>see</i> HOOKWORM DISEASE, DIAGNOSIS.	
FEDERATED MALAY STATES:	
Comparative methods of examination for hookworm infection	131-132
<i>See also</i> Kelantan.	
FELLOWSHIPS AND SCHOLARSHIPS:	
For <i>Les Visiteuses d'Hygiene</i>	26
Number and distribution.....	48-49
Granted by China Medical Board.....	254-256, 258
Also.....	42, 250
<i>See also</i> Names of persons.	
FENG, C. T.:	
Assistant in Chemistry, Pre-Medical School, Peking Union Medical College.....	245
FERRELL, DR. JOHN A.:	
Director for United States, International Health Board....	67, 77
FIJI ISLANDS, HOOKWORM DISEASE IN:	
Relief and control.....	91
Hemoglobin index among East Indians.....	120
Comparative methods of examination for infection.....	131-132
FLEXNER, DR. SIMON:	
Rockefeller Foundation:	
Member and Member Executive Committee, 1918, 1919..	12, 13, 65, 66
International Health Board:	
Member, 1918, 1919.....	67, 76
China Medical Board:	
Member, and Member Executive Committee, 1918, 1919..	67, 222, 223
Member Executive Committee and Member Board of Trustees, Peking Union Medical College, 1918, 1919....	224, 226
Member Executive Committee and Member Board of Trustees, Shanghai Medical School, 1918, 1919.....	228, 229

	PAGE
FLIES, <i>see</i> HOOKWORM LARVAE, VIABILITY.	
FLOTATION METHOD, <i>see</i> HOOKWORM DISEASE, DIAGNOSIS.	
FOLKS, HOMER:	
Representing American Red Cross, Tuberculosis Work in France.....	79
FOREIGN CHRISTIAN MISSIONARY SOCIETY:	
Appropriation for hospital at Luchowfu.....	250, 252
FOSDICK, HARRY EMERSON:	
Member Rockefeller Foundation, 1918, 1919.....	12, 13, 65
FRANCE:	
War work expenditures by Rockefeller Foundation for 1914- 1918, and appropriations for 1919.....	55
<i>See also</i> Commission for Prevention of Tuberculosis in France; Names of places.	
FUKIEN CHRISTIAN UNIVERSITY.....	250
FURBUSH, DR. C. L.:	
Member Yellow Fever Commission to Central America.....	79
GAGE, DR. HELEN R.....	254
GAGE, NINA D.....	254
GANGRENE, <i>see</i> ANTI-GASEOUS GANGRENE SERUM.	
GARDNER, DR. P. B.:	
State Director for St. Vincent, International Health Board..	78
GATES, DR. FREDERICK L.:	
Member China Medical Board, 1918, 1919.....	67, 222, 223
Member Board of Trustees, Shanghai Medical School, 1918, 1919.....	228, 229
GATES, FREDERICK T.:	
Member Rockefeller Foundation, 1918, 1919.....	12, 13, 65
Member International Health Board, 1918, 1919.....	67, 76
GEORGETOWN, BRITISH GUIANA.....	124
GEORGIA:	
Relief and control of hookworm disease.....	91
Lack of latrines in Hart County.....	167
Soil sanitation followed by general health improvement.....	184
GERMAN NEW GUINEA, <i>see</i> KOCH, DR. ROBERT.	
GERMANY:	
Reduction in hookworm infection in mines.....	153
GILFILLAN, EMILY:	
Librarian, Peking Union Medical College.....	243
GLYCERINE-SALT METHOD, <i>see</i> HOOKWORM DISEASE, DIAGNO- SIS.	
GODDARD, DR. F. W.....	254

	PAGE
GODDARD'S REVISION, <i>see</i> BINET-SIMON TEST.	
GOODMAN, FLORENCE K.....	246
GOODNOW, FRANK J.:	
Member China Medical Board, 1918, 1919.....	67, 222, 223
GORDON, J. DOROTHY.....	244
GORGAS, SURGEON-GENERAL WILLIAM C.:	
Director Yellow Fever Work, International Health Board...	35
Retirement from U. S. Army.....	35
Member International Health Board.....	67, 76
Member Yellow Fever Commission to Central America.....	79
Resumes operations of Yellow Fever Commission.....	83
GOVERNOR'S ISLAND, BRAZIL:	
Latrine accommodations.....	176
GRAND CHENIER BIRD REFUGE.....	71
GRANT, DR. J. B.:	
Associate State Director for China, International Health Board.....	77
GRANT, DR. J. S.....	255
<i>Green City, The, see</i> PEKING UNION MEDICAL COLLEGE.	
GREENE, ROGER S.:	
Resident Director in China, and Member China Medical Board, 1918, 1919.....	67, 222, 223
Also.....	232
GRENADA:	
Uniform type of latrine.....	178
GREY, DR. ERNEST G.:	
Professor of Surgery, Peking Union Medical College.....	239
GUAM, HOOKWORM DISEASE IN:	
Completion of infection survey and results.....	38, 39, 91, 92-93, 148, 149
GUARULHOS, BRAZIL, HOOKWORM DISEASE IN:	
Rates of infection and cures.....	114
Infection among farm workers.....	118
Intensive operations for control begun.....	151
GUATEMALA:	
Co-operation of International Health Board in control of yellow fever epidemic.....	35-36, 85-86
Cases of yellow fever and fatalities.....	86
Relief and control of hookworm disease.....	91
Improvement in sanitation.....	181
<i>See also</i> Yellow Fever.	
GUAYAQUIL, ECUADOR:	
Study of yellow fever infection.....	83-84

	PAGE
GUAYAQUIL, ECUADOR— <i>Continued</i> :	
Inauguration of measures against yellow fever.....	87-88
<i>See also</i> Yellow Fever; Yellow Fever Commission to Ecuador.	
GUNN, DR. S. M.:	
Associate Director Commission for Prevention of Tuberculosis in France.....	79
HACKER, DR. H. P.:	
<i>Treatment of Hookworm Infection</i>	140
Also.....	143
HACKETT, DR. L. W.:	
Associate Regional Director Brazil, International Health Board.....	77
HAMBURG, ARKANSAS, <i>see</i> ANTI-MOSQUITO MEASURES, <i>under</i> MALARIA CONTROL.	
HARRISON COUNTY, <i>see</i> MISSISSIPPI.	
HART COUNTY, <i>see</i> GEORGIA.	
HARVARD MEDICAL SCHOOL OF CHINA.....	249
HAWARD, EDITH J.:	
Acting Superintendent of Nurses, Training School for Nurses, Peking.....	246
HAWKINS, F. H.:	
Member Board of Trustees, Peking Union Medical College..	224, 225, 226, 227
HEISER, DR. VICTOR G.:	
Director for the East, International Health Board.....	67, 77
Member Yellow Fever Commission to Central America.....	77
HELLIWELL, DR. PAUL V.....	255
HEMOGLOBIN IN HOOKWORM DISEASE:	
Experiments with boys and soldiers.....	120
Rates among prisoners in Batavia.....	120
Rate of reduction by infection.....	119-120
Attempts to determine relative rates associated with infection.....	121-122
Results of treatment.....	122-123
<i>See also</i> Hookworm Disease, Infection.	
HEPBURN, A. BARTON:	
Member Finance Committee, Rockefeller Foundation, 1918, 1919.....	12, 13
Member Rockefeller Foundation, 1918, 1919.....	12, 13, 65
HLUANG BORIRACKSHA:	
Treatment of Siamese soldiers for hookworm disease.....	123

	PAGE
HODGES, DR. PAUL C.:	
Associate in Roentgenology, Peking Union Medical College .	240
HOLLAND:	
Reduction in hookworm infection in mines	153
HOOGHLY, INDIA:	
Hookworm infection in jail	113
HOOKWORM DISEASE, DIAGNOSIS:	
Methods	130
Use of vermifuge and microscope	130
Manner of submitting fecal specimens	130
Plain smear method	130-131
Centrifuge method and preparation of slides	131
Comparative results of methods	131-132, 135
Test cases in Brazil	132
Glycerine-salt method	132, 135
Process and accuracy of salt flotation-loop method	136-137
Difficulty of exact diagnosis	137
<i>See also</i> Worm Counts.	
HOOKWORM DISEASE, INFECTION:	
Rates shown by completed surveys	92
Effect on negroes and soldiers	93, 94
Light percentage and its effect on mentality	93, 95, 127-128
Effect on influenza and other diseases	94, 123
Favorable conditions for development of larvae	111
Rates in various countries	112-114
Method and value of worm counts	117
Effect on hemoglobin index	119-120
Comparative severity of types	120
Cumulative effects	121
Increase in body weight after treatment	122-123
Effect on birth rate	127
Rates affected by character of soil in Brazil	150
Spread by flies and dust	159
<i>See also</i> Hookworm Disease, Re-infection; Latrines; Soil Pollution.	
HOOKWORM DISEASE, INFECTION SURVEYS:	
Completed or authorized during 1918	91, 148-151
Scope	148
New type, its methods and advantages	151-152
<i>See also</i> Hookworm Disease, Relief and Control; Uncinari- asis Commission to the Orient.	
HOOKWORM DISEASE, METHODS OF TREATMENT:	
Necessity of purgative and vermifuge	138

	PAGE
HOOKWORM DISEASE, METHODS OF TREATMENT—Continued:	
Principal remedies used.....	138
Routine dosage of thymol.....	139
Routine dosage of oil of chenopodium.....	140-143, 144
Administration of Chenopodium-Croton oil.....	143
Importance of purgatives.....	144, 145
Relative efficiency of drugs.....	146, 147
<i>See also</i> Names of drugs.	
HOOKWORM DISEASE, RE-INFECTION:	
Causes.....	153-154
Lowest recorded percentage.....	154
Percentage in St. Vincent, Seychelles Islands, Nicaragua, Trinidad, and Ceylon.....	154-156
Highest recorded percentage.....	155
Contributing factors.....	156-157
HOOKWORM DISEASE, RELIEF AND CONTROL:	
Program of procedure and fields of operation.....	38-39, 91
Measures.....	81
Increased financial participation of official health agencies..	82
Requests from various countries for co-operation.....	92
Results of demonstrations in Brazil.....	97-98
Importance of prevention of soil contamination.....	98
Demonstration in Queensland.....	101-102
Work among southern troops of U. S. army.....	119
Campaigns followed by lower general morbidity rates....	123-124
Investigations on school children in Queensland.....	128-129
Nearest approaches to complete eradication.....	153
Basis of judging effectiveness of campaigns.....	156
Means of extending treatment.....	159-160
Important factors.....	160
Modified intensive plan.....	160, 163-164
Relative efficiency of regular and modified plans.....	163-164
Post-campaign measures in Ceylon.....	164-165
Soil sanitation.....	166-167
Amount expended.....	215-217
<i>See also</i> Latrines; Names of places.	
HOOKWORM LARVAE, VIABILITY:	
In soil and feces.....	157-158
Investigations in California and China.....	158
Investigations in storage pits, sand, flies, and dust.....	158-159
HOSPITAL SHIP FOR PHILIPPINE ISLANDS:	
Staff.....	79
Amount expended.....	215

	PAGE
HOSPITALS, <i>see</i> COMMISSION FOR PREVENTION OF TUBERCULOSIS IN FRANCE; MISSIONARY HOSPITALS IN CHINA.	
HOUGHTON, DR. HENRY S.:	
Acting Director, Peking Union Medical College.	236
<i>Also</i>	248
HOWARD, DR. HARVEY J.:	
Professor and Head of Department of Ophthalmology, Peking Union Medical College.	236
<i>Also</i>	255
HOWARD, DR. HECTOR H.:	
Director for the West Indies, International Health Board. . .	67, 77
<i>Also</i>	69
HSIEH, DR. EN-TSENG:	
Assistant in Anatomy, Peking Union Medical College	241
HU, CHENG-HSIANG.	258
HUGHES, CHARLES E.:	
Member Rockefeller Foundation, 1918, 1919.	12, 13, 65
HUMPHREYS, DR. J. C.	255
HUSSEY, HARRY H.	232-233
HYDRICK, DR. J. L.:	
State Director for Brazil, International Health Board.	77
HYGIENE, DEMONSTRATIONS IN TEACHING.	54, 69
INDIA:	
Work for control of hookworm disease.	91-92
Economic effect of hookworm disease among laborers.	95
Prevalence of malaria.	103
Source of hookworm infection.	112
<i>See also</i> Names of places.	
INDIAN MEDICAL SERVICE:	
Investigations on hookworm disease at Negapatam.	112
INDIAN RESEARCH FUND ASSOCIATION:	
Investigations on hookworm infection in Assam.	112
INDUSTRIAL RELATIONS:	
Conclusion of investigations.	50-52
Amount expended.	71
<i>Industry and Humanity</i> , by W. L. Mackenzie King.	51
INFANTILE PARALYSIS, AFTER-CARE.	50, 70
INFECTION SURVEYS, <i>see</i> HOOKWORM DISEASE, INFECTION SUR- VEYS.	
INFLUENZA:	
Death rate in Ceylon affected by hookworm disease.	94, 123
INGRAM, RUTH.	246

INSECTS, *see* HOOKWORM LARVAE, VIABILITY.

INTERNATIONAL HEALTH BOARD:

Co-operation with Guatemalan government in control of yellow fever epidemic.....	35-36, 85-86
Program of procedure in hookworm control.....	37-38
Use of hookworm demonstrations as a means to establish public health services.....	39
Co-operation with Brazilian government in survey of rural health problems.....	40
Five-year period of co-operation with Queensland and Papua	40
Public health work in North Carolina.....	43
Public health laboratory experts.....	44
Co-operation with Brazilian Medical Schools.....	47-48
Fellowships and scholarships and "study leave".....	48-49
Officers and members.....	67, 76
Financial statement with tables showing expenditures	70, 213-217
Personnel of staffs.....	77-79
Immediate object.....	81
Work with state health departments in prevention of soil contamination.....	96, 98
Reports and publications issued during 1917.....	107-109

INTERNATIONAL YOUNG MEN'S CHRISTIAN ASSOCIATION—

SERVICE FOR PRISONERS OF WAR, *see* CAMP AND COMMUNITY WELFARE WORK.

INTESTINAL PARASITES:

Prevalence in Brazil.....	113
<i>See also</i> Hookworm Disease, Infection; Names of parasites.	

JACAREPAGUA, BRAZIL:

Percentage of hookworm infection.....	113
---------------------------------------	-----

JACOBS, DR. W. P.:

Senior State Director for Ceylon, International Health Board	77
--	----

JAGUARIAHYIA, PARANA.....

	170
--	-----

JAILS, HOOKWORM DISEASE IN.....

112-113, 119	
--------------	--

JAMAICA, HOOKWORM DISEASE IN:

Completion of infection survey, with results.....	38-39, 91, 92-93, 148-149
Erection of latrines prerequisite to work for control.....	97, 170
Organization of sanitary department.....	178
<i>See also</i> Cayman Islands.	

JAMES, DR. MARY L.....

	255
--	-----

JAVA, HOOKWORM DISEASE IN:

Work for control among soldiers.....	92
--------------------------------------	----

	PAGE
JAVA, HOOKWORM DISEASE IN— <i>Continued</i> :	
Incidence of infection.....	118
Comparative infection among agriculturists and townspeople	118
Infection survey based on worm counts.....	151
<i>See also</i> Batavia.	
JEWISH WELFARE COMMITTEE, <i>see</i> CAMP AND COMMUNITY WELFARE WORK.	
JOHNS HOPKINS UNIVERSITY—SCHOOL OF HYGIENE AND PUBLIC HEALTH:	
Opening and future plans.....	41-42
Amount expended.....	70
Fellowships for Brazilian doctors.....	104
JOHNSTONE, DR. E. M.....	255
<i>Journal of the American Medical Association</i> :	
Spanish edition.....	47-48
JUDSON, HARRY PRATT:	
Member Rockefeller Foundation, 1918, 1919.....	12, 13, 65
Member China Medical Board, 1918, 1919.....	67, 222, 223
KAU, DR. EDWARD Y.....	256
KELANTAN, FEDERATED MALAY STATES:	
Request for assistance in control of hookworm disease.....	92
KENDALL, DR. A. I.:	
Chairman Yellow Fever Commission to Ecuador.....	78, 84
KENDALL, DR. A. I. and LEBREDO, DR. M. G.:	
<i>A Sanitary Survey of the Republic of Ecuador</i>	84
KENDRICK, DR. J. F.:	
State Director for Seychelles Islands, International Health Board.....	78
KENTUCKY:	
Relief and control of hookworm disease.....	91
Field investigations on latrines.....	168, 169
KIANGSI PROVINCE, CHINA, <i>see</i> PINGHSIANG COLLIERY, CHINA.	
KIBLER, DR. W. H.:	
State Director for Dutch Guiana, International Health Board.....	77
KING, TSE.....	258
KING, W. L. MACKENZIE:	
Conclusion of official connection with Rockefeller Foundation.....	50-51
Publication of <i>Industry and Humanity</i>	51
KIRK, ROBERT H.:	
Comptroller Rockefeller Foundation, 1918, 1919.....	12, 13, 65

KIRK, ROBERT H.—*Continued*:

Member Board of Trustees, Peking Union Medical College, 1918, 1919.....	224, 226
Visit to Peking.....	232

KLIGLER, DR. I. J.:

Studies on sewage disposal.....	168
---------------------------------	-----

KNIGHTS OF COLUMBUS, *see* CAMP AND COMMUNITY WELFARE WORK.

KNOWLTON, DR. R. H.:

Treatment of U. S. troops for hookworm infection.....	119
Method of determining efficiency of drugs.....	147

KOCH, DR. ROBERT:

Method of malaria control by treating carriers.....	194
---	-----

KOFOLD, DR. CHARLES A.:

Report on effect of hookworm infection at Camp Bowie.....	123
Results of investigations on hookworm disease and lowered mentality.....	128
Development of brine flotation-loop method of hookworm diagnosis.....	136
Investigations on viability of hookworm larvae.....	158

KORNS, DR. JOHN H.:

Associate in Medicine, Peking Union Medical College.....	240
Also.....	259

KOSLANDA-HAPUTALE, CEYLON..... 155

LA DIGUE, SEYCHELLES ISLANDS..... 177

LAKE VILLAGE, ARKANSAS, *see* ANTI-MOSQUITO MEASURES,
under MALARIA CONTROL.

LAMBERT, DR. S. M.:

Special member of staff for Australia, International Health Board.....	77
---	----

LANE, CHARLES E..... 235

LANE, LIEUT.-COL. CLAYTON:

Report on economic effect of hookworm disease among laborers in India.....	95
Investigations on hookworm disease in tea gardens	112, 124, 127

LATRINES:

Prerequisite to work for hookworm control.....	96-97, 170
Effect on infection rates.....	150-151
Statistics on accommodations in tropics and sub-tropics..	166-167
Types recommended.....	167-169
L. R. S. type.....	168

LATRINES—*Continued*:

Erected by government regulations in Ceylon and elsewhere	170, 173, 174
Awaken interest among Singhalese in Ceylon.....	174-175
In Pinghsiang Colliery, China.....	175-176
At Governor's Island, and Rio Bonito, Brazil.....	176-177
In schools in Costa Rica.....	181
One for every rural home in Stone and Harrison counties, Mississippi.....	182
Also.....	149, 154, 159, 163, 165
See also Sewage Disposal; Names of places.	
LAVENTILLE AREA, TRINIDAD.....	167
LEBREDO, DR. MARIO G.:	
Member Yellow Fever Commission to Ecuador.....	78, 84
LENNOX, DR. WILLIAM G.:	
Associate in Medicine, Peking Union Medical College.....	240
LEON BOURGEOIS DISPENSARY, <i>see</i> DISPENSARIES.	
<i>Leptospira icteroides</i> :	
Apparent cause of yellow fever.....	85
LESHER, DR. C. B.....	255
LEWIS, DR. S. C.....	255
LEXINGTON, NORTH CAROLINA.....	185
LI, DR. T. M.:	
Associate in Ophthalmology, Peking Union Medical College	240
LIAU, DR. C. C.....	256
LIEGE, <i>see</i> BELGIUM.	
LIQUEFACTION TANK.....	178
See also Latrines.	
LINCOLN, DR. C. S. F.....	255
LING, WEN-PING.....	262
LIU, DR. C. C.....	256
LIU, DR. JUI-HUA:	
Assistant in Otology, Rhinology and Laryngology, Peking Union Medical College.....	241
Also.....	256
LOEBER, MRS. I. K.....	245
LOH, VEN-TSAO.....	258
LOUISIANA:	
Relief and control of hookworm disease.....	91
LOVE, DR. O. H.....	255
LUCHOWFU, CHINA, <i>see</i> FOREIGN CHRISTIAN MISSIONARY SOCIETY.	
LYONS, FRANCE.....	26, 201-202, 206

MA, K. M.	
Instructor in Chinese, Peking Union Medical College...	242, 244
MA, MING-HAI:	
Assistant in Physics, Pre-Medical School, Peking Union Medi-	
cal College.....	245
McCOY, MARY.....	246
McCULLOUGH, E. GRACE:	
Dietitian, Peking Union Medical College.....	243
MACKENZIE KING, W. L., <i>see</i> KING, W. L. MACKENZIE.	
McKIMMEY, TERESA:	
Nurse, Hospital Ship for Philippine Islands.....	79
McLEAN, DR. FRANKLIN C.:	
Director, Peking Union Medical College.....	235
MADRAS (PRESIDENCY):	
Request for assistance in hookworm control.....	38, 92
MAGNESIUM SULPHATE.....	142, 145
MAHE, SEYCHELLES ISLANDS.....	177
MALARIA:	
Prevalence and economic cost.....	103, 119
MALARIA CONTROL:	
Continuation of work.....	31
Co-operation of state boards of health of Arkansas and Mis-	
sissippi.....	33-34
Publicity work in Sunflower County.....	34
Results of field experiments.....	102-103
Types of field experiments.....	186
Anti-Mosquito measures:	
Per capita cost.....	31-32, 191, 192-193
Purposes and study.....	186
Methods and results of experiments at Crossett, Arkansas	
.....	186-187
Methods and results of experiments at Hamburg, Arkansas	
.....	187, 188, 191
Further demonstrations at Lake Village, Dermott, Mon-	
ticello, and Bauxite.....	191, 192
Screening:	
Tests in efficiency and cost at Lake Village, Arkansas..	193-194
Quinine:	
Index rates and per capita cost.....	193, 194
Dosage.....	197
Treatment of carriers:	
Demonstration, results, and cost per capita in Sunflower	
County, Mississippi.....	32-33, 197-199

MALARIA CONTROL—*Continued*:

Experiments by Dr. Robert Koch.....	194
Preliminary Study in Bolivar County, Mississippi.....	197
General summary.....	200
Expenditures.....	215-216
MANDERSON, DR. MABEL.....	255
MAO, H. C.....	248
MAP OF ACTIVITIES, ROCKEFELLER FOUNDATION.....	18
MARACAS AREA, TRINIDAD.....	167
MARANHAO, MADRAS:	
Infection survey authorized.....	148
MARSEILLES, FRANCE.....	201-202
MARYLAND:	
Relief and control of hookworm disease.....	91
Soil sanitation followed by general health improvement in Wicomico County.....	184
MASKELIYA, UPPER, <i>see</i> UPPER MASKELIYA, CEYLON.	
MATALE AREA, CEYLON.....	155, 156, 164, 174
MATARA, CEYLON.....	174
MAURITIUS:	
Request for assistance in hookworm control.....	92
Gift to Seychelles government.....	177
MAXWELL, DR. J. PRESTON:	
Professor and Head of Department of Obstetrics and Gynecology, Peking Union Medical College.....	236
Also.....	254
MEDICAL EDUCATION, <i>see</i> PUBLIC HEALTH AND MEDICAL EDUCATION.	
MEDICINAL TANK.....	27-28
MENINGITIS SERUM.....	275
MENTAL HYGIENE, STUDIES AND DEMONSTRATIONS.....	50, 70
<i>See also</i> National Committee for Mental Hygiene.	
Metchnikoff (LABORATORY CAR).....	119, 159
MEXICO:	
Source of yellow fever infection in Guatemala.....	86
MEYER, ERNST C.:	
Director Department of Surveys and Exhibits, International Health Board.....	67, 77
MILLER, EDYTH L.:	
Librarian Rockefeller Foundation.....	12, 13, 65
MILLER, DR. F. A.:	
Senior Field Director for Maryland, International Health Board.....	78

	PAGE
MILLER, DR. J. A.:	
Associate Director, Commission for Prevention of Tuberculosis in France.....	79
MILLS, DR. RALPH G.:	
Professor and Head Department of Pathology, Peking Union Medical College.....	236
MINAS GERAES, BRAZIL:	
Hookworm infection survey.....	91, 148
Compulsory erection of latrines.....	170
MINES, <i>see</i> BELGIUM; CHINA; GERMANY; HOLLAND; PINGHSIANG COLLIERY, CHINA.	
MINIM (UNIT OF MEASURE).....	note, 140
MINUWAGONDA, CEYLON.....	174
MISSIONARY HOSPITALS IN CHINA:	
Grants by China Medical Board.....	250, 252
<i>See also</i> Names of missionary organizations.	
MISSISSIPPI:	
Relief and control of hookworm disease.....	91
Installation of a latrine for every rural home in Harrison and Stone Counties.....	182
<i>See also</i> Malaria Control.	
MODIFIED INTENSIVE PLAN, <i>see</i> HOOKWORM DISEASE, RELIEF AND CONTROL.	
MOLLOY, DR. D. M.:	
Senior State Director for Nicaragua, International Health Board.....	78
MONROE, PAUL:	
Member Board of Trustees, Peking Union Medical College..	226
MONTICELLO, ARKANSAS, <i>see</i> ANTI-MOSQUITO MEASURES, <i>under</i> MALARIA CONTROL;	
MOONEY, MABEL.....	258
MOONEY, WINIFRED.....	258
MOSQUITO, <i>see</i> MALARIA CONTROL; NAMES OF SPECIES.	
MOTT, JOHN R.:	
Member China Medical Board, 1918, 1919.....	67, 222, 223
Chairman and Member Board of Trustees, Peking Union Medical College, 1918, 1919.....	224, 226
MUANG PRAO, SIAM.....	178
MURPHY, STARR J.:	
Rockefeller Foundation:	
Member Executive Committee and Member, 1918, 1919..	12, 13, 65, 66

MURPHY, STARR J.—*Continued*:

International Health Board:

Member, 1918, 1919.....67, 76

China Medical Board:

Member and Member Executive Committee, 1918, 1919....

67, 222, 223

Member Executive Committee and Member Board of

Trustees, Shanghai Medical School..... 228

Member Board of Trustees, Shanghai Medical School, 1919. 229

MYERS, LOUIS G.:

Treasurer Rockefeller Foundation, 1918, 1919.....12, 13, 65

NANDASMO, NICARAGUA..... 154

NANTES, FRANCE.....26, 206

NATIONAL COMMITTEE FOR MENTAL HYGIENE.....53, 54, 69

See also Mental Hygiene, Studies and Demonstrations.

NATIONAL COMMITTEE FOR PREVENTION OF BLINDNESS..... 71

NATIONAL CONFERENCE OF STATE AND PROVINCIAL HEALTH

OFFICERS..... 168

NATIONAL ORGANIZATION FOR PUBLIC HEALTH NURSING.....50, 70

NATIONAL RESEARCH COUNCIL.....53, 54, 69

Necator americanus and Ankylostoma duodenale.....120, 141

NEGAPATAM, INDIA..... 112

NETHERLANDS, *see* HOLLAND.

NEW, DR. WAY SUNG:

Assistant in Surgery, Peking Union Medical College..... 242

Also..... 258

NEW GUINEA..... 101

NEW MEXICO:

Hookworm infection among army recruits..... 119

NEW YORK ASSOCIATION FOR IMPROVING CONDITION OF THE

POOR..... 71

NICARAGUA, HOOKWORM DISEASE IN:

Relief and control..... 91

Erection of latrines prerequisite to work for control.....97, 170

Value and results of worm counts..... 117

Examinations on anemia caused by infection..... 121

Average hemoglobin index..... 122

Decree ordering examination of school children..... 127

Percentage of re-infection..... 154

Improvement in sanitation..... 181

NINETEENTH ARRONDISSEMENT, PARIS, *see* PARIS, 19TH ARRONDISSEMENT.

	PAGE
NOGUCHI, DR. HIDEYO:	
Member Yellow Fever Commission to Ecuador.....	78, 84
<i>A Bacteriological Study of Yellow Fever</i>	84
Isolates supposed yellow fever organism.....	85
NORRIS, DR. W. PERRIN:	
Associate Director for the East, International Health Board	77
Associate Regional Director for Ceylon, International Health Board.....	77
NORTH, FRANK M.:	
Member Executive Committee and Member Board of Trustees, Peking Union Medical College, 1918, 1919.....	224, 225, 226, 227
NORTH CAROLINA:	
Three-year programs for public health work.....	43
Relief and control of hookworm disease.....	91
County health organization.....	98
State laws regarding latrines.....	173
Results of rural health work.....	183
Soil sanitation and lowered typhoid death rate.....	184
NORTH CHINA AMERICAN SCHOOL, TUNGCHOW.....	248
NORTH CHINA LANGUAGE SCHOOL UNION.....	247-248
NORTH QUEENSLAND, AUSTRALIA:	
Remodeling of latrines.....	177
NURSE, PUBLIC HEALTH.....	43-44
<i>See also</i> National Organization for Public Health Nursing.	
NURSES' ASSOCIATION OF CHINA.....	263
NURSES' TRAINING SCHOOLS, <i>see</i> COMMISSION FOR PREVENTION OF TUBERCULOSIS IN FRANCE; TRAINING SCHOOL FOR NURSES, PEKING	
OIL OF CHENOPodium:	
Variations in strength and toxicity.....	138
Young's rule for administration.....	138
Widespread use in treatment of hookworm disease.....	138, 139
Standard method of administration, with dosage for children and adults.....	138, 140-141
Average efficiency in Brazil and the Orient.....	140, 141
Contraindications.....	140, 144
Experiments among Brazilian vagabonds.....	141
Tests in efficacy under field conditions in Brazil.....	142
Effect on egg-bearing functions of female hookworms.....	142
Purgatives.....	142-143, 144-145
Undivided doses.....	144

	PAGE
OIL OF CHENOPODIUM—Continued:	
Full effect on hookworms.....	144-145
In treatment of dysentery.....	145
Relative efficiency.....	146
Also.....	163, 164
<i>See also</i> Chenopodium-Croton Oil.	
OKLAHOMA:	
Hookworm infection among army recruits.....	119
ONDERNEEMING INDUSTRIAL SCHOOL, BRITISH GUIANA.....	159
OSWALDO CRUZ INSTITUTE, RIO DE JANEIRO.....	47
OVA, DETECTION OF, <i>see</i> HOOKWORM DISEASE, DIAGNOSIS.	
PACKARD, CHARLES W.:	
Instructor in Biology, Pre-Medical School, Peking Union Medical College.....	244
PACKER, MRS. SOPHIA.....	247
PAGE, WALTER H.:	
Member International Health Board.....	67, 76
PAI, HSIU-LAN.....	247
PANAMA, HOOKWORM DISEASE IN:	
Relief and control.....	91
Examinations on anemia caused by infection.....	121
Average hemoglobin index.....	122
Use of oil of chenopodium.....	139
Government appropriation for public and school latrines....	181
PAPUA, HOOKWORM DISEASE IN:	
Co-operation of International Health Board in five-year pro- gram of rural sanitation.....	40
Infection survey.....	98, 101
Erection of latrines prerequisite to work for control.....	170
PARAGUAY:	
Work for control of hookworm disease.....	91-92
PARANA (STATE) BRAZIL:	
Prevalence of hookworm infection.....	113
Infection survey authorized.....	148
Advance sanitation.....	170
Compulsory erection of latrines.....	170
PARASITES, <i>see</i> INTESTINAL PARASITES.	
PARIS, 19TH ARRONDISSEMENT:	
Work for tuberculosis control.....	23-24, 202, 205, 206
PARK, DR. W. H.....	255
PAUL, DR. G. P.:	
State Director for Fiji Islands, International Health Board...	78

	PAGE
PAYANG, SIAM.....	178
PAYNE, DR. G. C.:	
State Director for Trinidad, International Health Board....	78
PEABODY, FRANCIS W.:	
Member China Medical Board, 1918, 1919.....	67, 222, 223
Member Board of Trustees, Shanghai Medical School, 1918, 1919.....	228, 229
PEARCE, DR. R. M.:	
Adviser in medical education.....	79
PEDROSO, DR. ALEXANDER:	
Member Brazilian Advisory Commission.....	79
PEKING PRIMARY SCHOOL AND KINDERGARTEN.....	248
PEKING UNION MEDICAL COLLEGE:	
Progress in construction.....	45
Called "The Green City".....	45
Growth of Medical and Pre-Medical schools.....	45-46
Officers, Members, and Executive Committee, 1918, 1919,	224-227
General progress.....	231
Visit of R. H. Kirk.....	232
Faculty members and administrative officers....	235-236, 239-244
Announcement of work issued.....	251
PEKING UNION MEDICAL COLLEGE—PRE-MEDICAL SCHOOL:	
Opening.....	45
Faculty members and administrative officers.....	244-247
PERNAMBUCO, BRAZIL:	
Work for hookworm control.....	91-92
PETER'S HALL DISTRICT, BRITISH GUIANA.....	124
PHYSICIANS' CALLS:	
Reduced by anti-mosquito measures for malaria control....	31, 187, 188, 191, 192
PINGHSIANG COLLIERY, CHINA:	
Progress in hookworm control.....	39
Latrine accommodations and storage pits.....	170, 175-176
Infection survey and organization of permanent sanitary de- partment.....	175-176
PINHEIRO, RIO DE JANEIRO (STATE):	
Experiments in use of oil of chenopodium among Brazilian vagabonds.....	141
PLAIN SMEAR METHOD, <i>see</i> HOOKWORM DISEASE, DIAGNOSIS.	
PLAYGROUND AND RECREATION ASSOCIATION OF AMERICA, <i>see</i> CAMP AND COMMUNITY WELFARE WORK.	
PNEUMONIA, <i>see</i> ANTI-PNEUMOCOCCUS SERUM.	

	PAGE
POLAND:	
Expenditures by Rockefeller Foundation for 1914-1918 and appropriations for 1919.....	55
POLIOMYELITIS, <i>see</i> INFANTILE PARALYSIS, AFTER-CARE.	
POLK, DR. ETHEL.....	255
PORT-DOUGLASS-MOSSMAN, QUEENSLAND.....	173
PORTEUS MAZES:	
Retardation tests on children in Queensland.....	129
PORTO RICO:	
Average hemoglobin index.....	122
Efforts toward hookworm control.....	153
POWELL, DR. CHARLES A.....	256
PREGNANCY.....	139, 163
<i>See also</i> Birth Rate.	
PRISONERS OF WAR WELFARE:	
Expenditures by Rockefeller Foundation, 1914-1918, and appropriations for 1919.....	55, 69
PRIVIES, <i>see</i> LATRINES.	
PUBLIC HEALTH AND MEDICAL EDUCATION:	
Future plans and policies.....	42-44
Amount expended.....	215, 216
PUBLICATION COMMITTEE, CHINA MEDICAL MISSIONARY ASSOCIATION.....	259
PURGATIVES:	
Occasions for omission in treatment of hookworm disease, 142-143	
Efficacy as a vermifuge.....	144-145
<i>See also</i> Names of drugs.	
QUEENSLAND, HOOKWORM DISEASE IN:	
Infection survey begun.....	38-39
Co-operation of International Health Board in five-year program of rural sanitation.....	40
Relief and control.....	91
Mental tests among infected children.....	93, 128-129
Demonstration in control.....	101-102
Effect of rainfall on infection.....	111
Rate of infection.....	113
Type of latrines.....	167
Erection of latrines prerequisite to work for control.....	170
Latrines required by local authority.....	173
<i>See also</i> Names of places.	
QUININE, <i>see</i> MALARIA CONTROL.	

	PAGE
RAINFALL:	
Effect on hookworm infection in Queensland.....	111
READ, BERNARD E.....	256
RED CROSS, <i>see</i> AMERICAN RED CROSS.	
REDENBAUGH, H. E.:	
Member Yellow Fever Commission to Ecuador.....	78, 84
<i>A Chemical Study of Yellow Fever</i>	84
REGION DU NORD, FRANCE.....	30, 206
REID, JAMES C.:	
Member Board of Trustees, Peking Union Medical College, 1918, 1919.....	224, 225, 226, 227
REINSCH, PAUL S.....	232
RE-INFECTION, <i>see</i> HOOKWORM DISEASE, RE-INFECTION.	
RETALHULEU, GUATEMALA.....	86
RETARDATION TESTS, <i>see</i> BINET-SIMON TEST; PORTEUS MAZES.	
RICE, DR. J. L.:	
Associate State Director for Guatemala, International Health Board.....	78
RIO BONITO, BRAZIL:	
Rates of hookworm infection and cures.....	114
Erection of latrines.....	176-177
RIO DE JANEIRO (CITY):	
Government examination of school children for hookworm disease.....	92, 127
RIO DE JANEIRO (STATE), HOOKWORM DISEASE IN:	
Relief and control.....	91
Percentage of infection.....	113, 117
Infection in vagabond boys.....	118
Infection among workers and children on coffee plantations..	118
Compulsory erection of latrines:.....	170
<i>See also</i> Pinheiro, Rio de Janeiro (State).	
RIO DE JANEIRO, UNIVERSITY OF, <i>see</i> UNIVERSITY OF RIO DE JANEIRO.	
ROBBINS, DR. EMMA E.....	254
ROBERTSON, DR. OSWALD H.:	
Associate Professor of Medicine, Peking Union Medical College	239
ROCKEFELLER, JOHN D.:	
Member Rockefeller Foundation, 1918, 1919.....	12, 13, 65
ROCKEFELLER, JOHN D., JR.:	
Rockefeller Foundation:	
Chairman Finance Committee, 1918, 1919.....	12, 13
Chairman Board of Trustees, 1918, 1919.....	12, 13, 65
Member, 1918, 1919.....	12, 13, 65

ROCKEFELLER, JOHN D. JR.—*Continued*:

International Health Board:

Member. 67, 76

China Medical Board:

Member. 67, 222, 223

ROCKEFELLER FOUNDATION:

Officers, Members, and Committees, 1918, 1919. . . . 12-13, 65-66

List of activities. 19-20

Tuberculosis work in France. 20-31

Demonstrations in malaria control. 31-34

Yellow fever commissions. 35-37

Work in control of hookworm disease. 37-41

School of Hygiene and Public Health, Johns Hopkins University. 41-42

Public health and medical education. 42-44

Peking Union Medical College. 44-46

Shanghai Medical School. 46

Medical education in Brazil. 47-48

Fellowships and scholarships. 48-49

Appropriations to Rockefeller Institute for Medical Research 49-50

Appropriations for studies in mental hygiene, after-care of infantile paralysis, dispensaries, and public health nursing. 50

Completion of investigations in industrial relations by W. L. Mackenzie King. 50-52

War-work appropriations and expenditures, 1914-1919, and policy in distribution. 52-56

Receipts and disbursements. 56-58

Report of Secretary. 61-71

Organization and agencies. 65-66

Regular meetings and meetings of executive committee. . . 66

Members and officers of departmental boards. 67

Work with unaffiliated organizations. 68

Expenditures for war work, public health, medical education and research, and miscellaneous. 69-71

Also. 24

Report of Treasurer. 285-355

Balance sheet: Exhibit A. 288-289

Receipts and disbursements of income: Exhibit B. . . . 290-292

Foundation's appropriations: Exhibit C-G. 293-302

Miscellaneous: Exhibit H. 303-305

International Health Board: Exhibit I. 306-313

China Medical Board appropriations: Exhibit J. 314-335

	PAGE
ROCKEFELLER FOUNDATION—Continued:	
Summary of appropriations and payments: Exhibit K. . . .	336
Additional appropriations for future years: Exhibit L. . . .	337
Statement of appropriations and payments from income of special funds: Exhibit M.	338
Statements of principal funds: Exhibit N.	339-340
Land, buildings, and equipment funds: Exhibit O.	341-342
Transactions relating to invested funds: Exhibit P.	343-346
Schedule of securities in general funds: Exhibit Q.	347-354
Schedule of securities in special funds: Exhibit R.	355
ROCKEFELLER INSTITUTE FOR MEDICAL RESEARCH:	
Added appropriations by Rockefeller Foundation.	49-50
War work and special appropriations by Rockefeller Founda- tion.	53
Expenditures and appropriations for war research, relief and instruction, 1914-1919.	54
Expenditures and appropriations for War Demonstration Hospital.	54, 69
Amount expended, 1918.	70
Study of types of latrines.	168
War activities.	269-270
ROCKEFELLER INSTITUTE FOR MEDICAL RESEARCH—DEPART- MENT OF ANIMAL PATHOLOGY:	
Production of serums at Princeton, New Jersey.	276, 277
<i>See also Serums.</i>	
ROCKEFELLER INSTITUTE FOR MEDICAL RESEARCH—WAR DEM- ONSTRATION HOSPITAL:	
Staff and courses of instruction.	271-274
Preparation of serums.	274-278
Treatment of syphilis.	279
Researches on streptococci.	280
<i>See also Serums.</i>	
RODEO, COSTA RICA:	
Increase in average hemoglobin index.	122
Re-infection percentage.	154
ROSE, WICKLIFFE:	
Rockefeller Foundation:	
Member Executive Committee and Member, 1918, 1919. . .	12, 13, 65, 66
International Health Board:	
General Director.	67, 76, 77

	PAGE
ROSE, WICKLIFFE— <i>Continued</i> :	
China Medical Board:	
Member and Member Executive Committee, 1918, 1919...	67
	222, 223
Member Board of Trustees, Peking Union Medical College	224
ROSENWALD, JULIUS:	
Member Rockefeller Foundation, 1918, 1919.....	12, 13, 65
RULEVILLE, SUNFLOWER COUNTY, MISSISSIPPI, <i>see</i> TREATMENT OF CARRIERS, <i>under</i> MALARIA CONTROL.	
RYDER, ALICE:	
Assistant in English, Pre-Medical School, Peking Union Medi- cal College.....	245
RYERSON, M. A.:	
Member Rockefeller Foundation.....	12, 65
ST. CLOUD, FRANCE.....	279
ST. ETIENNE, FRANCE.....	201-202
ST. JAMES HOSPITAL, ANKING.....	250
ST. JOHN'S UNIVERSITY, SHANGHAI.....	250
ST. LUCIA, WEST INDIES, HOOKWORM DISEASE IN:	
Relief and control.....	91
Use of oil of chenopodium as anthelmintic.....	139
ST. VINCENT, WEST INDIES, HOOKWORM DISEASE IN:	
Relief and control.....	91
Percentage of re-infection.....	154
SALT-FLotation METHOD, <i>see</i> HOOKWORM DISEASE, DIAGNOSIS.	
SALTS:	
In treatment of hookworm disease.....	144
SALVADOR, HOOKWORM DISEASE IN:	
Relief and control.....	91
Decree ordering examination of school children.....	127
Erection of latrines prerequisite to work for control.....	170
Mounted sanitary police to assist in soil sanitation.....	181
SAN DOMINGO, COSTA RICA:	
Rate of hookworm infection.....	112
SAN JOSE, GUATEMALA.....	86
SAN MARCAS, COSTA RICA:	
Average hemoglobin index.....	122
SANATORIA.....	21, 23
<i>See also</i> Commission for Prevention of Tuberculosis in France; Names of hospitals and of places.	
SAND, <i>see</i> HOOKWORM LARVAE, VIABILITY.	

	PAGE
<i>Sanitary Survey of the Republic of Ecuador</i> , by Drs. A. I. Kendall and M. G. Lebrede	84
SANTA CRUZ, TRINIDAD	178
SANTO DOMINGO, WEST INDIES:	
Request for assistance in control of hookworm disease	92
SAO PAULO (STATE) BRAZIL, HOOKWORM DISEASE IN:	
Completion of infection survey, with findings	38, 91, 92-93, 148, 150-151
Relief and control	91
Rates of various parasitic infections	113, 117-118
Infection among workers and children on coffee plantations . .	118
Infection in vagabond boys as shown by hemoglobin index .	118, 120
Tests in efficacy of oil of chenopodium in treatment	142
Rate of infection affected by character of soil	150
Tests in relative efficiency of regular and' modified intensive plans for control	163-164
Latrines on coffee plantations	166-167
Compulsory erection of latrines	170
SAO PAULO, UNIVERSITY OF, <i>see</i> UNIVERSITY OF SAO PAULO, BRAZIL—DEPARTMENT OF HYGIENE.	
SAYLES, FLORENCE	254
SCHAPIRO, DR. L.:	
Senior State Director for Costa Rica, International Health Board	77
SCHAUR, MARTHA	247
SCHOLARSHIPS, <i>see</i> FELLOWSHIPS AND SCHOLARSHIPS.	
SCHOOL OF FISHERIES, TIENTSIN, CHINA	260
SCHOOL OF HYGIENE AND PUBLIC HEALTH, <i>see</i> JOHNS HOPKINS UNIVERSITY—SCHOOL OF HYGIENE AND PUBLIC HEALTH.	
SCHOOLS, <i>see</i> CHILDREN; ONDERNEEMING INDUSTRIAL SCHOOL, BRITISH GUIANA.	
SEARS, DR. LAURENCE M.:	
Assistant in Modern European Languages, Peking Union Medical College	240, 245
SEPTIC TANK	151, 168, 183
<i>See also</i> Latrines.	
SERBIA:	
Expenditures by Rockefeller Foundation for 1914-1918, and appropriations for 1919	55
SERUMS:	
Produced by Department of Animal Pathology, Rockefeller Institute for Medical Research	274
Also	271

SERUMS—*Continued*:

See also Anti-dysenteric Serum; Anti-gaseous Gangrene Serum; Anti-pneumococcus Serum; Meningitis Serum.

SEWAGE DISPOSAL:

Problem defined by sanitary surveys.....	166
Special commission to study methods.....	168
Results of survey.....	169
Soil sanitation to proceed in advance of treatment for hookworm disease.....	170
Cause of health improvement.....	184-185
Amount expended.....	215
<i>See also</i> Latrines; Names of places.	

SEYCHELLES ISLANDS, HOOKWORM DISEASE IN:

Relief and control.....	91
Undivided doses of oil of chenopodium.....	144
Percentage of re-infection.....	154
Complete sanitation in advance of treatment campaign 97, 170, 177	
Gift from Government of Mauritius.....	177
Also.....	39

SHANGHAI MEDICAL SCHOOL:

Construction postponed.....	46, 249
Trustees, 1918, 1919.....	228, 229
Gift from Harvard Medical School of China.....	249

SHANTUNG CHRISTIAN UNIVERSITY..... 250

SHIH, P. L..... 245

SIA, DR. R. H. P.

Assistant Resident Surgeon, Peking Union Medical College..	242
--	-----

SIAM, HOOKWORM DISEASE IN:

Relief and control.....	91
Infection in soldiers.....	94, 122-123
Rate of infection.....	113
Value and results of worm counts.....	117
Average hemoglobin index in Chiengmai.....	122
Diagnosis of infection by glycerine-salt and plain smear methods.....	132, 135
Treatment of dysentery with oil of chenopodium.....	145
Erection of latrines prerequisite to work for control.....	170
Soil sanitation in Chiengmai.....	178
Also.....	39

SINGHALESE LABORERS, CEYLON..... 175

SION HILL, ST. VINCENT..... 154

SKINN, A. J.:

Acting Treasurer, Peking Union Medical College.....	243
---	-----

SLIDES, <i>see</i> HOOKWORM DISEASE, DIAGNOSIS.	
SMEAR, <i>see</i> HOOKWORM DISEASE, DIAGNOSIS.	
SMILLIE, DR. W. G.:	
Associate Professor of Hygiene and Public Health, School of Hygiene and Public Health, University of Sao Paulo	79, 104
SMYLY, DR. H. JOCELYN:	
Associate in Medicine, Peking Union Medical College	241
SNODGRASS, DR. J. E.:	
State Director for Ceylon, International Health Board	77
SOIL:	
Various formations as affecting pollution	169
<i>See also</i> Hookworm Larvae, Viability; Latrines; Soil Pollu- tion.	
SOIL POLLUTION:	
Importance and means of prevention	98
Offense punishable by law in Ceylon	173
<i>See also</i> Latrines; Sewage Disposal; Names of places.	
SOIL SANITATION, <i>see</i> SEWAGE DISPOSAL.	
SOLDIERS, HOOKWORM DISEASE IN:	
Treatment by Government in Java	92
Treatment by Hluang Boriracksha in Siam	94, 122-123
<i>See also</i> Metchnikoff (Laboratory Car); United States Army.	
SOUTH CAROLINA:	
Relief and control of hookworm disease	91
Insanitary conditions	167
Soil formation and latrines	169
SOUTHERN STATES:	
Enlarged hookworm programs by local agencies	82
Relief and control of hookworm disease	91
Results of experiments in malaria control	102-103
Results of rural health work	181-183
<i>See also</i> Names of states.	
SPEER, ROBERT E.:	
Member Executive Committee and Member Board of Trus- tees, Shanghai Medical School, 1918, 1919	228, 229
<i>Stegomyia</i> (Mosquito)	37, 87
STEPHENSON, BIRD R.:	
Instructor in Physics, Pre-Medical School, Peking Union Medical College	244
STIFLER, WILLIAM W.:	
Dean and Instructor in Physics, Pre-Medical School, Peking Union Medical College	244
Also	248

	PAGE
STILES, DR. C. W.....	139
STONE, ROBERT S.:	
Assistant in Anatomy, Peking Union Medical College.....	242
STONE COUNTY, <i>see</i> MISSISSIPPI.	
STORAGE PITS, <i>see</i> HOOKWORM LARVAE, VIABILITY.	
STRAUSS, FREDERICK:	
Member Finance Committee and Member Rockefeller Foun-	
dation, 1918, 1919.....	12, 13, 65
STREPTOCOCCI, RESEARCHES ON.....	280
STRUSE, DR. A. M.:	
State Director for Guatemala, International Health Board...	78
SUN, F. T.....	260
SUNFLOWER COUNTY, MISSISSIPPI, <i>see</i> MALARIA CONTROL.	
SURVEYS, <i>see</i> HOOKWORM DISEASE, INFECTION SURVEYS.	
SWANN, JOAN.....	247
SWARTZ, PHILIP A.:	
Director of Religious Work, Peking Union Medical College..	243
SWEET, LULA.....	247, 256
SYPHILIS.....	279
SYRIA, <i>see</i> ARMENIAN AND SYRIAN RELIEF.	
SZE, ELIZABETH.....	258
 TAMIL COOLIES, CEYLON.....	 163
TANK, MEDICINAL, <i>see</i> MEDICINAL TANK.	
TAPACHULA, MEXICO.....	86
TAYLOR, DR. ADRIAN S.:	
Professor and Head of Department of Surgery, Peking Union	
Medical College.....	236
Also.....	256
TAYLOR, DR. H. A.:	
State Director for Arkansas, International Health Board....	78
TAYLOR, DR. HARVEY B.:.....	256
TEA GARDENS:	
Hookworm infection in Assam.....	112
Results of investigations in Darjeeling District.	124, 127
TECHNIQUE OF EXAMINATION, <i>see</i> HOOKWORM DISEASE,	
DIAGNOSIS.	
TENNESSEE:	
Relief and control of hookworm disease.....	91
TESTS, <i>see</i> BINET-SIMON TEST; PORTEUS MAZES.	
TEXAS, HOOKWORM DISEASE IN:	
Relief and control.....	91
Infection among army recruits.....	119

	PAGE
TEXAS, HOOKWORM DISEASE IN— <i>Continued</i> :	
Data on infection in dust.....	159
Lack of latrines.....	167
THOMSON, DR. J. O.....	256
THYMOL:	
Used in treatment for hookworm disease in Siamese soldiers..	123
Contraindications.....	139
Routine dosage and conditions concerning administration..	139
Also.....	138
TOULOUSE, FRANCE.....	201-202
TRAINING CAMPS, <i>see</i> CAMP AND COMMUNITY WELFARE WORK.	
TRAINING SCHOOL FOR NURSES, <i>see</i> COMMISSION FOR PREVEN-	
TION OF TUBERCULOSIS IN FRANCE.	
TRAINING SCHOOL FOR NURSES, PEKING:	
Faculty.....	246-247
TRAVELING EXHIBITS, <i>see</i> COMMISSION FOR PREVENTION OF	
TUBERCULOSIS IN FRANCE; MEDICINAL TANKS.	
<i>Treatment of Hookworm Infection</i> , by Drs. S. T. Darling, M. A.	
Barber, and H. P. Hacker.....	146
TRINIDAD, HOOKWORM DISEASE IN:	
Relief and control.....	91
Statistics of infection.....	114, 117
Effects of sanitary reforms.....	123-124
Use of oil of chenopodium as anthelmintic.....	139
Percentage of re-infection.....	155-156
Lack of latrines.....	167
Government assistance in advance sanitation.....	178
<i>See also</i> Santa Cruz, Trinidad.	
TROUP COUNTY, <i>see</i> GEORGIA.	
TSEN, DR. E. T. H.:	
Associate in Bacteriology, Peking Union Medical College....	241
Also.....	258
TSINANFU UNION MEDICAL COLLEGE, <i>see</i> SHANTUNG CHRISTIAN	
UNIVERSITY.	
Tso, ERNEST....	258
TUBERCULOSIS:	
Efforts toward control in France.....	25-27
Also.....	47
<i>See also</i> Commission for Prevention of Tuberculosis in	
France.	
TUBERCULOSIS BUREAU OF THE AMERICAN RED CROSS, <i>see</i>	
AMERICAN RED CROSS.	
TUNAPUNA, TRINIDAD.....	123

TURKEY:

Expenditures by Rockefeller Foundation, 1914-1918, and appropriations, 1919.....	55
TYPHOID BACILLI, VIABILITY.....	168, 169
TYPHOID FEVER.....	43, 184, 185

UNCINARIASIS COMMISSION TO THE ORIENT:

Results of investigations on effect of infection on hemoglobin index.....	120
Results of investigations on comparative methods of examination for infection.....	131-132
Recommendation on dosage of oil of chenopodium in treatment.....	139, 144
Develops new type of infection survey	151

UNITED STATES ARMY, HOOKWORM DISEASE IN:

Results of examinations for infection.....	93
Infection at Camp Jackson, South Carolina.....	119
Lowered mentality caused by infection.....	128
Methods employed in diagnosis in Southern Department....	136
<i>See also</i> Soldiers, Hookworm Disease in; Names of camps.	

UNITED STATES PUBLIC HEALTH SERVICE.....33, 34, 35, 85, 86

UNITED WAR WORK FUND.....54, 69

UNIVERSITY OF CHICAGO—MEDICAL SCHOOL:

Amount expended.....	70
----------------------	----

UNIVERSITY OF RIO DE JANEIRO:

Course in hygiene established.....	104, 107
------------------------------------	----------

UNIVERSITY OF SAO PAULO—DEPARTMENT OF HYGIENE:

Assistance of International Health Board.....	47
Professors.....	79
Formal opening.....	104
Fellowships at Johns Hopkins University.....	104

UPPER MASKELIYA, CEYLON..... 155

VERMIFUGE, *see* HOOKWORM DISEASE, DIAGNOSIS; NAMES OF DRUGS.

VERSAILLES, FRANCE..... 205

VIABILITY, *see* DYSENTERY BACILLI, VIABILITY; HOOKWORM LARVAE, VIABILITY; TYPHOID BACILLI, VIABILITY.

VINCENT, G. E.:

Rockefeller Foundation:

President, 1918, 1919.....	12, 13, 65
Chairman Executive Committee and Member, 1918, 1919.....	12, 13, 65, 66

	PAGE
VINCENT, G. E.— <i>Continued</i> :	
International Health Board:	
Chairman, 1918, 1919.....	67, 76
China Medical Board:	
Chairman.....	67, 224
Member and Member Executive Committee, 1918, 1919.....	222, 223
Chairman and General Director, 1919.....	223
Chairman Executive Committee and Member Board of Trustees, Peking Union Medical College, 1918, 1919..	224, 226
Chairman and Chairman Executive Committee, Board of Trustees, Shanghai Medical School, 1918, 1919....	228, 229
Member Board of Trustees, Shanghai Medical School, 1918, 1919.....	228, 229
Succeeds Dr. Buttrick as Director.....	260
VIRGINIA:	
Relief and control of hookworm disease.....	91
<i>Visiteuses d'hygiene</i>	24, 26-27
<i>See also</i> Commission for Prevention of Tuberculosis in France.	
WAITE, DR. J. H.:	
State Director for Australia, International Health Board....	77
WAKEFIELD, DR. PAUL J.....	256
WAR CAMP COMMUNITY SERVICE, <i>see</i> CAMP AND COMMUNITY WELFARE WORK.	
WAR DEMONSTRATION HOSPITAL, <i>see</i> ROCKEFELLER INSTITUTE FOR MEDICAL RESEARCH.	
WAR RELIEF COMMISSION:	
Expenditures by Rockefeller Foundation, 1914-1918, and appropriations for 1919.....	55
Expenditures, 1918.....	69
WAR WORK EXPENDITURES, <i>see</i> NAMES OF ORGANIZATIONS.	
WASHBURN, DR. B. E.:	
Senior State Director for North Carolina, International Health Board.....	78
WELCH, DR. WILLIAM H.:	
International Health Board:	
Member.....	67, 76
China Medical Board:	
Member, 1918, 1919.....	67, 222, 223

WELCH, DR. WILLIAM H.— <i>Continued</i> :	
Member Board of Trustees, Peking Union Medical College, 1918, 1919.....	224, 226
Member Board of Trustees, Shanghai Medical School, 1918, 1919.....	228, 229
WELIGAMA-KORALE, CEYLON.....	174
WEST INDIES:	
Relief and control of hookworm disease.....	91
Progress of soil sanitation.....	178
Also.....	39
<i>See also</i> Names of places.	
WHITE, DR. JOSEPH H.:	
Director Yellow Fever Control measures in Guatemala..	36, 79, 86
WICOMICO COUNTY, <i>see</i> MARYLAND.	
WILSON, GEORGE G.:	
Secretary and Treasurer, Peking Union Medical College....	243
WILSON, STANLEY D.:	
Instructor in Chemistry, Pre-Medical School, Peking Union Medical College.....	245
WINSOR, DR. S. A.:	
Senior Field Director for Ceylon, International Health Board	77
WOLF, ANNA D.:	
Superintendent of Nurses, Training School for Nurses, Peking	246
WONG, S. Y.:	
Assistant in Physiological Chemistry, Peking Union Medical College.....	242
WOO, ARTHUR W.:	
Assistant in Obstetrics and Gynecology, Peking Union Medical College.....	242
WOO, DR. LAN SUNG.....	258
WOO, LOO SUNG.....	258
WOO, SHU-TAI.....	258
WOOD, JOHN W.:	
Vice-Chairman and Member Board of Trustees, Shanghai Medical School, 1918, 1919.....	228, 229
WOODS, DR. ANDREW H.:	
Associate Professor of Neurology and Psychiatry, Peking Union Medical College.....	239, 256
WORM COUNTS.....	117-121, 151, 164
<i>See also</i> Hookworm Disease, Diagnosis.	
WU, LILLIAN.....	258

WYATT, DR. B. L.:

- Associate Director Commission for Prevention of Tuberculosis in France. 79

YALE MOBILE HOSPITAL UNIT. 54

YELLOW FEVER:

- Difficulties of diagnosis. 36
 Epidemic in Guatemala. 79, 85-86
 Study of infection begun at Guayaquil, Ecuador. 83-84
 Organism isolated by Dr. Noguchi. 85
 Measures for extermination in Guayaquil, Ecuador 87-88
 Amount expended in control. 215, 216

YELLOW FEVER COMMISSION TO CENTRAL AMERICA:

- Program. 35
 Epidemic in Guatemala and its control 35, 36
 Personnel. 79
See also Guatemala.

YELLOW FEVER COMMISSION TO ECUADOR:

- Study of infection and inauguration of control measures . . . 36-37
 Personnel and arrival at Guayaquil. 78, 83-84
See also Guayaquil.

YEN, DR. F. C.:

- Associate State Director for China, International Health Board. 77

YEN, HSIU. 260

YIH, WEI-LI. 258

YOH, DR. GRACE. 258

YOUNG, DR. CHARLES W.:

- Associate in Medicine, Peking Union Medical College. 241
 Also. 256

YOUNG MEN'S CHRISTIAN ASSOCIATION. 54, 69

YOUNG MEN'S CHRISTIAN ASSOCIATION—INTERNATIONAL SERVICE FOR PRISONERS OF WAR. 56

YOUNG WOMEN'S CHRISTIAN ASSOCIATION. 54, 69

YOUNG'S RULE FOR ADMINISTERING OIL OF CHENOPodium. . . . 138

YU, C. M.:

- Assistant in Chinese, Peking Union Medical College. 242, 245

ZAU, DR. ZUNG-DAU. 258

ZUCKER, ADOLF E.:

- Instructor in English and German, Peking Union Medical College. 243, 245

THE ROCKEFELLER FOUNDATION

Annual Report for 1919

CONTENTS

THE ROCKEFELLER FOUNDATION

	PAGE
PRESIDENT'S REVIEW.....	I
REPORT OF THE SECRETARY	51
REPORT OF THE TREASURER.....	345

INTERNATIONAL HEALTH BOARD

REPORT OF THE GENERAL DIRECTOR.....	63
Appendix.....	125

CHINA MEDICAL BOARD

REPORT OF THE GENERAL DIRECTOR.....	255
A Review of Its Work from 1915 to 1919, by Roger S. Greene, Resident Director in China.....	305

ILLUSTRATIONS

	PAGE
World map of activities of Rockefeller Foundation	4-5
Motor clinic used in rural health work, Lee county, Mississippi	77
Side view of rural motor clinic	77
Dental clinics at rural schools	78
Typhoid vaccination day at schoolhouse in Pine Grove community, Jackson county, Mississippi	81
Conferente of county health officers, state of North Carolina . .	82
One step in the eradication of yellow fever. Disappearance of the disease from Guayaquil, Ecuador, after beginning of control measures	89
Simplification of apparatus and reduction in size of squads. Yellow fever control measures in Guayaquil	91
Type of tank used for storing water in the municipality of Guayaquil, Ecuador	92
Eager admirers of the hygienic Punch-and-Judy. The exhibit appears at the left	95
Effect of hookworm on growth. Queensland, Australia	96
Growth of interest in anti-hookworm work in Brazil, 1917-1919	109
Family of sixteen, each member infected with hookworm disease. Marion county, Mississippi	131
Group of Australian aborigines assembled for hookworm treatment	132
Retardation in growth, due to hookworm disease	141
Tamil boy, before treatment for hookworm disease	142
Same boy six months later, after being cured of hookworm disease	142
Hookworm infection survey map of Porto Rico	180
Medical director examining patients to determine their fitness for receiving hookworm treatment. Ceylon	191
Education is one of the most important features of the world-wide campaign against hookworm disease. Two groups assembled in Costa Rica to hear a lecture on the disease	192
Accustoming primitive peoples to the use of latrines is fundamental to hookworm control	201
Type of latrine erected for boys' school in Santiago, Panama	202
Type of fly-proof pit latrine with wooden superstructure	207
New latrine of the bucket type with brick superstructure, erected on the Syston estate	208

	PAGE
Different countries employ different means of guarding against soil pollution. Type of pail latrine adopted for use in Queensland, Australia.....	211
Example of one of the better methods of night soil disposal. Type of incinerator adopted for use on all estates belonging to Messrs. George Steuart and Company, Ceylon.....	212
Record of malaria control in four Arkansas towns.....	219
One phase of mosquito control in rural regions. Mill pond in Hinds county, Mississippi.....	221
Same pond after being drained, cleaned, and edged.....	221
Pond in Hinds county, Mississippi, after being cleaned and edged, and stocked with top minnows.....	222
Patio in tenement house district of Guayaquil, near center of city.....	231
Typical patio in outskirts of city of Guayaquil, Ecuador.....	232
One of the posters used for creating interest in public health work in France.....	237
Taking health messages to the schoolchildren of France.....	238
Organization and activities of Commission for the Prevention of Tuberculosis in France.....	240
First-year class in the Pre-Medical Department of the Peking Union Medical College.....	261
Unit of the Peking Union Medical College, showing general type of architecture.....	269
Detail of roofs of the Peking Union Medical College.....	270
Architect's drawing of new Science Building of St. John's University.....	281
Map of China, showing medical institutions aided by China Medical Board.....	282
Number of Fellowship and Scholarship holders, by years, since creation of China Medical Board.....	296

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THE JOURNAL OF THE
ROYAL ANTHROPOLOGICAL INSTITUTE
OF GREAT BRITAIN AND IRELAND
PUBLISHED BY THE INSTITUTE
OF GREAT BRITAIN AND IRELAND
IN THE YEAR 1911

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THE ROCKEFELLER FOUNDATION

President's Review

To the Members of the Rockefeller Foundation:
Gentlemen:

I have the honor to transmit herewith a general review of the work of the Rockefeller Foundation for the period January 1, 1919, to December 31, 1919, together with the detailed reports of the Secretary and the Treasurer of the Foundation, the General Director of the International Health Board, and the General Director of the China Medical Board.

Respectfully yours,
GEORGE E. VINCENT,
President

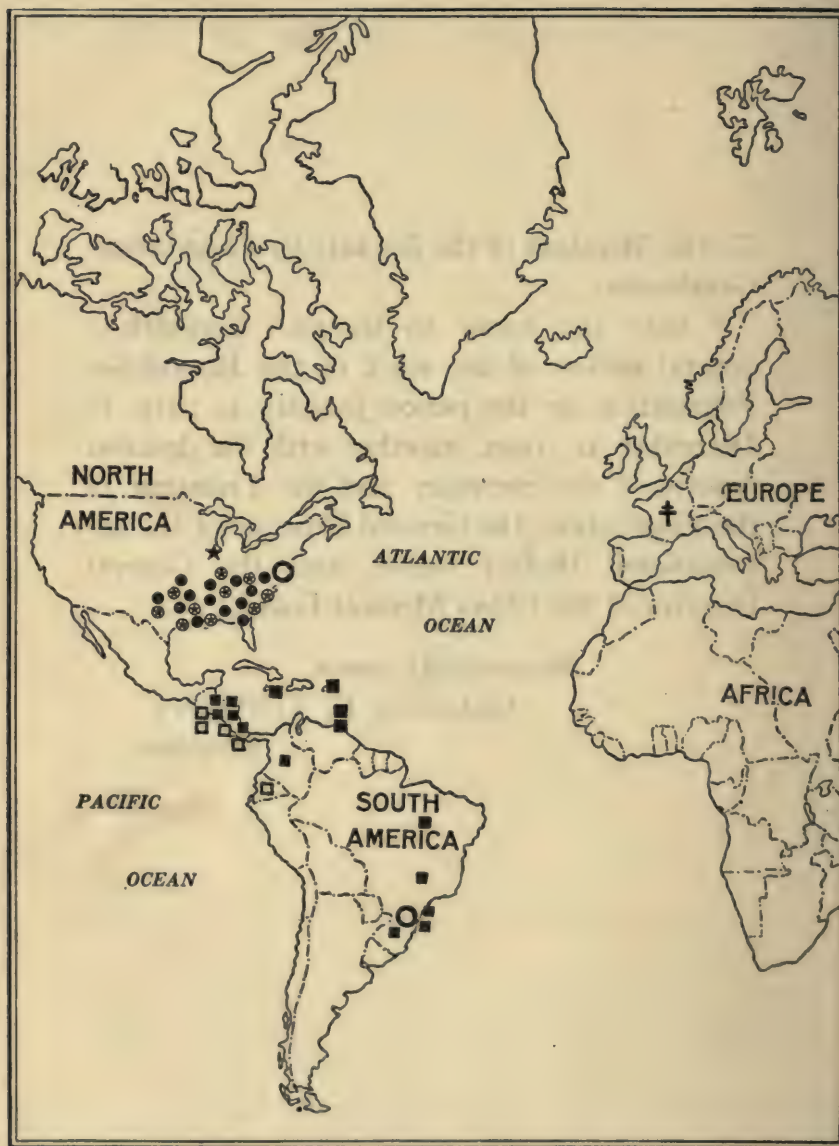
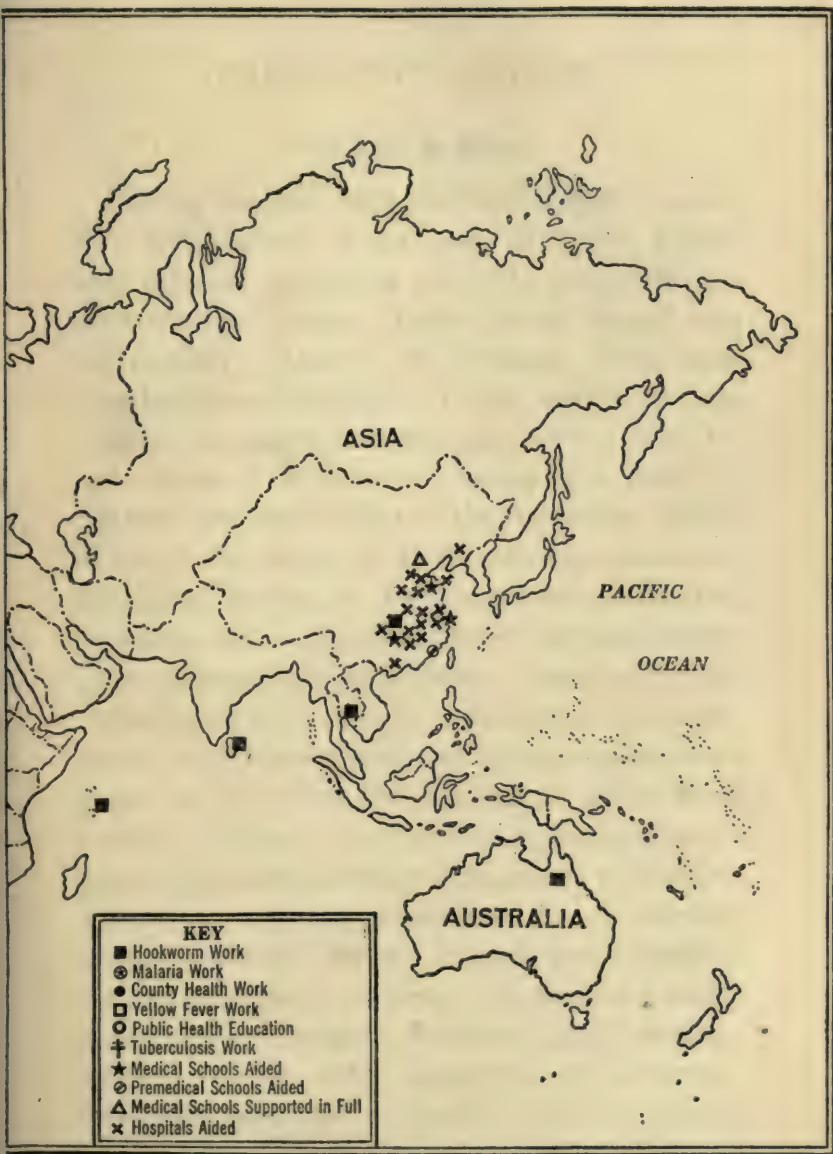


Fig. 1.—World map of activities of



Rockefeller Foundation during 1919



PRESIDENT'S REVIEW

The Year in Brief

During the year 1919 the Rockefeller Foundation participated in activities of public health and medical education in thirty-nine different governmental areas. Yellow fever control was successfully extended in Ecuador, Nicaragua, Honduras, and Salvador. Public health progress through co-operative campaigns for the cure and prevention of hookworm disease was made in thirteen southern states of the American Union, in six of the states of Brazil, in five islands of the West Indies, in five countries of Central America, and in Ceylon, the Seychelles Islands, China, Queensland and Siam. Demonstrations in the control of malaria were continued in Arkansas and Mississippi, and arrangements were made for extending the program to eight other southern states. A systematic organization for combating tuberculosis in France was widened to include twenty-one departments. A modern medical school under Foundation auspices opened its doors in Peking; pre-medical schools were aided in Changsha, Shanghai, and Nanking; medical courses were supported in Tsinanfu; seventeen hospitals in various parts of China were aided. Co-operation was continued in the

maintenance of an Institute of Hygiene in São Paulo University in Brazil. A School of Hygiene and Public Health at Johns Hopkins University was entirely supported by Foundation funds. Fellowships in American University centers were granted to seventy-three students of medicine and public health from China, Brazil, Ceylon, Salvador, Czecho-Slovakia, and the United States. Continuing studies of public health and medical education, officers of the Foundation made special visits to the Far East, Europe, Canada, and South America.

A Sequel to Cuba and Panama

The sanitary conquest of Havana and of the Canal Zone by American medical officers was the first brilliant victory in a campaign for the gradual restriction and control of yellow fever. For a century and a half this disease had been continuously present in Havana, where at times it had destroyed entire crews of visiting vessels. The disease almost exterminated a French army in Haiti. In 1842 half the population of Guayaquil (Ecuador) was carried off. New Orleans was often infected; the epidemic of 1878 took a toll of 13,000 lives in the Mississippi Valley.

When the United States forces occupied Cuba, a group of army medical officers, headed by Dr. Walter Reed, was sent to the island to find out

the means by which yellow fever is transmitted. In 1881 Dr. Carlos Finlay of Havana had suggested that the infection might be traced to the bite of a mosquito. To the lay mind this theory was palpably preposterous; even medical opinion did not take it seriously. The belief generally held was that the disease was spread by contact either with a person who had yellow fever, or with rooms, bedding, or clothing which he had contaminated.

Following the discovery by Ross that malaria is transmitted by the mosquito, the American officers undertook ingenious experiments with yellow fever. Volunteers were asked to submit themselves to a variety of tests, such as living in a screened building filled with bedding and apparel which had been used by fever patients, receiving injections of blood taken from infected persons, and exposure to the bites of mosquitoes which had access to fever hospitals. The response of officers and enlisted men to this challenge was a fine example of calm, high-minded courage. Dr. Lazear sacrificed his life in the interest of science and humanity.

The experiments were completely successful; they proved conclusively that yellow fever is carried from one person to another by a female mosquito of the species known as *Stegomyia*. This insect is thoroughly domestic in its habits

and almost invariably breeds in artificial, or man-made, containers. It prefers rain barrels, cisterns, cans, bottles, and similar receptacles which contain clean water. It seldom flies more than 200 yards and usually bites during the daylight hours. The female *Stegomyia* which bites a person who has yellow fever during the first three days of illness, can after twelve days and up to a limit of twenty days transmit the infection to a healthy individual, who will develop the fever within three to six days after infection.

The discovery of these facts gave a firm basis for sanitary procedures. By depriving the *Stegomyia* of breeding facilities and by screening the houses against adult mosquitoes, General William C. Gorgas, first in Havana and later in the Panama Zone, achieved a notable control both of yellow fever and of another mosquito-borne infection, malaria. Inspired by these triumphs, Dr. Oswaldo Cruz succeeded in ridding Rio de Janeiro of yellow fever, a feat soon emulated by Dr. Liceaga at Vera Cruz.

During the past fifteen years measurable progress has been made in controlling epidemics and in gradually restricting yellow fever to a few seed-beds of infection in which the disease has continuously persisted. Up to 1918 the chief of these endemic centers were Guayaquil in Ecuador, Merida in Yucatan, and suspected areas in

Venezuela, along the coast of Brazil, and possibly along the West Coast of Africa. To eradicate yellow fever from these seed-beds and thus to rid the world of the disease, is the high adventure upon which the Rockefeller Foundation embarked in 1918 under the leadership of General Gorgas. The results so far have been substantial and encouraging.

On the Trail of the Yellow Fever Germ

Until recently, attempts to discover the organism which incites yellow fever had failed. How the *Stegomyia* mosquito goes about her work was fully understood, but just what she injects into her victims remained a mystery. Obviously, knowledge of the specific germ would be of the greatest service in making a final attack upon the seed-beds. Yellow fever looks so much like certain other diseases, especially infectious jaundice, that a means of identification would be immensely useful. Again, if the germ were isolated there would be a chance of preparing a serum which would both cure and protect. So it was deemed best to make further investigations into this phase of the problem before the practical field work was begun.

Guayaquil was selected as the most favorable center for research. There, cases of yellow

fever were always available, and experienced physicians skilful in detecting them were at hand. The one man peculiarly fitted by natural abilities, training, and experience to pursue the elusive organism was the eminent bacteriologist of the Rockefeller Institute, Dr. Hideyo Noguchi, who had made a special study of its near relative, the germ of infectious jaundice. The government of Ecuador and the city of Guayaquil extended courteous invitations, the Rockefeller Institute for Medical Research was ready to co-operate, Noguchi welcomed the opportunity. In 1918 a Commission headed by Dr. A. I. Kendall of Northwestern University set sail for South America.

The Commission was hospitably received by the authorities and the medical profession of Guayaquil, so that Noguchi was able to begin his investigations promptly. His Ecuadorean collaborators were able to show him indisputable cases of yellow fever. With the blood of patients who were in the early stages of the disease Noguchi infected guinea pigs. These fell ill, showing symptoms which resembled those of men suffering from yellow fever. The blood of the first group of guinea pigs was used to inoculate another group, in which the same manifestations of disease duly appeared. Dogs and monkeys proved to be susceptible in a

similar way. Attempts to transfer the infection from one animal to another by means of *Stegomyia* mosquitoes were successful. Finally Noguchi was able to cultivate from the blood a minute, delicate, thread-like, spiral organism—half-way between a microscopic animal (microbe) and a microscopic plant (bacterium). To this he gave the name *Leptospira icteroides*, "slim spiral, the jaundice maker."

Although Noguchi did not assert that he had discovered the inciting germ of yellow fever, and was careful to state that he wished to test his results at Guayaquil by further investigations in other places, especially in Merida, Yucatan, there is no doubt that he has made an enormously valuable contribution to the knowledge of the disease. Furthermore, his discovery of the slim, spiral jaundice-maker enabled him to prepare a serum. This has been administered in a number of cases with apparently favorable effect. The number of trials is of course too small to decide the actual value of the serum. The patients might have recovered without it. All that can be said at present is that it seems more than likely that a means of identifying yellow fever has been found, and that the chances are good of substantially reducing the mortality of the disease, which now ranges between 40 and 85 per cent, and furthermore that a vaccine can be

made which apparently protects non-immunes against infection.

Mobilizing to Fight the Fever in Its Stronghold

The average number of cases of yellow fever annually reported in Guayaquil for the years 1912-1918, inclusive, was 259. In 1918 the total reached 460. It was in November, 1918, that a representative of the International Health Board of the Rockefeller Foundation arrived in Guayaquil to organize a campaign of eradication. He came upon the scene when the disease was at its height. In December, eighty-eight new cases were recorded. The attack was undertaken on the invitation of the authorities both of Ecuador and of Guayaquil, who left nothing undone to insure success. Officials were delegated to co-operate in the program. Special municipal ordinances were enacted and rigidly enforced to compel compliance with the measures which were recommended. The editors of the city pledged themselves to support the undertaking and to refrain from premature criticism of methods or results.

Only one American was sent to Guayaquil to organize the staff, which was made up of Ecuadoreans many of whom were experienced in yellow fever work. Within a short time more than a hundred men were recruited and assigned

to their tasks. In order that the members of the group might work intelligently, they were frequently assembled for instruction and conference. Lectures were given and bulletins published. In this way a sense of team-work was fostered; each man saw his own task in relation to the whole program. The resulting enthusiasm and loyalty to the cause were most gratifying. The education of the public was not neglected. By means of addresses, pamphlets, bulletins, and press articles the plan was described to the citizens, and the reasons for the measures employed were explained.

For the prosecution of the work the city was divided into districts, to each of which was assigned a sanitary squad of four or five men. A corps of inspectors supervised the operations as a whole. A spot map of Guayaquil was prepared. This showed the location of each case of fever that had originated in the city. The density of the spots indicated the areas in which intensive measures ought first to be applied. The campaign aimed at two things: (1) the earliest possible discovery of cases of yellow fever, which were to be promptly isolated and screened from mosquitoes; and (2) the elimination of the *Stegomyia* by denying the females access to water in which to deposit their eggs. It was the peculiar condition of the public water

supply which presented the chief problem. The hydrants of Guayaquil flow only an hour and a half in twenty-four. The well-to-do have tanks on the upper floors of their houses; the less fortunate store water in barrels, cans, and other containers. These conditions were ideal for the breeding of the *Stegomyia*. It was not difficult to screen the tanks, or to protect barrels with wooden covers. Water could be poured through screened holes. It could be drawn off through spigots inserted near the bottom of the barrels.

Fish Versus Mosquitoes

There remained a good many open receptacles which it was hard to protect. Resort was had to the experiment of recruiting fish to live in these containers and to eat the mosquito eggs as fast as they were deposited. The first kind of fish tried was a disappointment. It was nervous, easily frightened, and short-lived. A hardy fish was next drafted, but this turned out to be so vigorous that it was always jumping out of the water. Finally a satisfactory fish was discovered. It ate larvae gluttonously and darted to the bottom of the barrel whenever the surface of the water was disturbed. Thus, by a variety of attacks—drainage, filling, oiling, screening, and the mobilizing of minnows, the *Stegomyia* was baffled.

By early January, 1919, the control work was far advanced. In spite of warnings and explanations the public expected immediate results. In November, 1918, eighty-one cases had been reported. Although the control measures had not been started until the last week in November, the people confidently believed that there would be a sharp reduction in the cases in December. When eighty-eight cases were reported for that month there was general disappointment. The American director made a plea for suspension of judgment, and the control measures were vigilantly and rigorously continued. Here are the figures for successive months: January, eighty-five; February, forty-three; March, seventeen; April, three; May, two; June, none. Since June, 1919, no case has been reported.

It is too early to affirm that yellow fever has been completely eradicated from Guayaquil. Vigilance will not be relaxed for a year at least. During the wet season of 1920 cases may recur. Nevertheless the possibilities of control have been convincingly demonstrated. Guayaquil, the chief seed-bed of yellow fever, has been free from the disease for months. The public has proclaimed its deliverance from a menace which had never been absent since 1842. General Gorgas's ambition to write "The Last Chapter of Yellow Fever" seems no Utopian dream.

A League of Central American Nations

While the seed-bed in Guayaquil was being successfully sterilized, an epidemic in Central America also demanded attention. In June, 1918, an outbreak in Guatemala had been reported. This increased alarmingly week by week. At last, on the invitation of Government, an expert sanitarian was sent to organize an attack upon the disease. By quarantine, isolation of cases, and anti-mosquito measures the epidemic was brought under control before the end of the year. The sources of the infection were believed to be the city of Merida, Yucatan, and possibly other points in southern Mexico. The continuance in 1919 of approved precautions protected Guatemala against a recurrence of the fever. Later the disease appeared in Honduras, Salvador, and Nicaragua.

Offers of assistance were warmly welcomed by the governments of these countries, and the Foundation promptly dispatched a group of experts headed by General Gorgas. In each country a special government commission was created to take charge of control measures. The body was composed of local physicians and sanitarians, with one representative of the International Health Board of the Rockefeller Foundation. Each country provided at least a part of

the cost of control. The Foundation contributed the services of its expert staff members, and made additional appropriations toward the common budgets. These several commissions co-operated in an international program for the protection of all the areas concerned. It was a practical League of Nations on a small scale and for a specific object. The plan was carried out energetically and thoroughly, to such purpose that by the middle of November yellow fever had been practically banished from Central America. Although the epidemic was not severe, so far as the number of cases went, these cases were scattered over a rather wide area and if prompt measures had not been taken they might easily have led to a serious situation.

The commissions are being continued in authority, and concerted efforts will be made during 1920 to guard against another outbreak. The governments of Nicaragua, Salvador, Guatemala, and Honduras have agreed to control *Stegomyia* mosquito breeding in all ports, to require daily inspection of ships which touch at Pacific points, to discover whether there are *Stegomyia* breeding places on board, and to maintain a six-day quarantine against all travelers from southern Mexico until yellow fever has been eliminated from that country.

With Guayaquil free from fever, and with Central America protected, a good start has been made upon the world-wide project of extirpation. Plans for the early future include the sending of commissions to Peru, where yellow fever appeared early in 1919; and, with the active co-operation of the British Government, to the suspected area on the west coast of Africa. It is hoped also that a way will be found to banish yellow fever from southern Mexico. The League is widening its membership and is going confidently forward.

Diversified Attacks on Malaria

At the same time that the *Stegomyia* was being thwarted in Ecuador and Central America, her cousin, the *Anopheles* mosquito, which specializes in malaria, was being baffled in Mississippi and in Arkansas, where experiments in the control of "chills and fever" were continued in six towns and started in four others. The contrast between the striking symptoms and swift mortality of yellow fever and the less obtrusive but more protracted effects of malaria may easily conceal from the uninformed the real menace of the latter malady. Malaria is a crippling and deadly disease which attacks or threatens the 800,000,000 people who live within the zone of its influence. In India alone it is estimated that

1,300,000 die annually from its effects. The southern part of the United States, the whole of Mexico, and Central America, the West Indies, and the northern countries of South America, lie within the malaria belt, which practically coincides with the tropical and semi-tropical regions of the earth.

The scientific basis for malaria control is firmly established. The infection can be communicated only by the *Anopheles* mosquito, which differs from the *Stegomyia* in being a rural or suburban insect, easily detected by its habit of standing on its head when at rest. Unlike its yellow fever colleague it prefers water containing grass or other plants in which to breed. Quinine has long been successfully employed to destroy malaria parasites in the blood and thus free the sufferers from their infection. The practical measures for fighting malaria, then, are clearly indicated: (1) to eliminate *Anopheles* by preventing their breeding; (2) to screen the houses against this mosquito; (3) to sterilize by quinine the blood of human malaria carriers. In a given demonstration one or all of these methods may be used, according to local conditions. Anti-mosquito measures were relied upon almost wholly in the four Arkansas towns in which experiments were carried on during 1919. A reduction of 67 per cent in the prevalence of malaria

was secured at a per capita cost of sixty cents, exclusive of the overhead expense of supervision.

The object of these demonstrations was to show that methods of control which have been successful in large towns and cities are applicable to villages at an expense which the communities can and will assume. The results have fully confirmed the expectations of the Board. Continued supervision of control projects which have been in progress for four years in six Arkansas towns affords convincing proof that it costs a community approximately a four-fold greater sum to harbor malaria than to banish it. As a consequence of these demonstrations public funds for malaria control operations are now being appropriated faster than sanitarians can be found to do the work.

Other anti-malaria experiments were undertaken or continued during 1919. In Hinds county, Mississippi, a rural area of thirty-six square miles, with a population of 830 people, was selected for one of the experiments. Encouraging progress was made, but it was not possible by the end of the year to reach conclusive results. The method of sterilizing malaria carriers was continued in Sunflower county, Mississippi, after an experiment which in 1918 seemed to indicate that in an area of about one hundred square miles with a population

of 9,000, an area which represented typical plantation conditions in the Mississippi delta, reasonable control could be secured at a per capita cost of a little more than one dollar. In 1919 the experiment was extended, with encouraging prospects of success, to a considerably larger area.

Still further tests will be made during 1920 by screening isolated farm houses and cabins in places where large-scale anti-mosquito operations are economically impracticable, and by concentrating scattered plantation dwellings in order more easily to protect their occupants by means of screening and of mosquito control. A significant feature of the 1919 campaign was the use of top minnows to consume the eggs of the *Anopheles*. This proved a cheap and effective measure, especially in the case of stock ponds which were used for watering cattle and horses, and which could not be drained or covered with a film of oil.

A Co-Operative Anti-Malaria Campaign

From the outset of its health work the Foundation's International Health Board has entered an area only at the invitation of the government concerned. All of its work has been based upon at least three primary considerations: (1) co-operation with the authorities; (2) the community's assumption of some part of the expense; and (3) an agreement that if the experiment is

successful, the government will take over the enterprise as a part of its official machinery. Thus, in the Arkansas and Mississippi malaria demonstrations, work was begun in co-operation with the local and state authorities and with the United States Public Health Service. The United States Public Health Service did notable work during the war in malaria control in the areas which surrounded the large army camps, and as a consequence trained a group of sanitarians to be expert in anti-mosquito measures.

In June, 1919, a conference was held to plan a concerted campaign against malaria in the Southern States. Representatives of the United States Public Health Service, of the state departments of health, and of the International Health Board of the Rockefeller Foundation were present. After full discussion these men worked out a program which was subsequently approved and adopted in ten states. It is proposed to carry on simultaneously in at least four communities in each of these states a systematic anti-malaria campaign. The object is two-fold: first, to test the measures of control by applying them under a wide range of varying conditions; and second, to educate a larger public with the hope of arousing sufficient sentiment for the support of a comprehensive effort to eliminate malaria from the whole South.

In the execution of the plan the Federal authorities, the state boards, the International Health Board, and local governments will contribute either personnel or funds or both, in accordance with a program sufficiently flexible to meet varying conditions. The whole enterprise is based upon two principles: (1) whole-hearted co-operation without duplication of effort; and (2) assumption by governmental agencies of responsibility for administration and expense. This concrete example of team-work in preventive medicine will be watched with interest. There is reason to hope that its success will insure a concerted and persistent attempt throughout the South to shake off the burden which malaria imposes upon that region.

Hookworm Control in Many Lands

First in point of time among the diseases to be dealt with by the International Health Board, hookworm disease still remains its chief concern so far as areas covered, personnel employed, and funds expended are concerned. The disease is widely prevalent in tropical and semi-tropical regions. In parts of Porto Rico, in the low-lying districts of Colombia, on many of the plantations of Ceylon and Dutch Guiana, and in the mines of China, an infection rate of about 90 per cent is found. The hookworms, lodged in the

intestinal tract, impoverish the victim's blood and produce an anemia which impairs bodily and mental vigor. The malady is easily curable, but the campaigns are not of permanent value unless proper sanitation is introduced to protect the soil from pollution and the population from re-infection. For this reason the Board is declining more and more to undertake control measures until governments have actually seen fit to enforce the necessary sanitary provisions.

In 1919 hookworm control measures were continued in twenty-five different states and countries; surveys or campaigns were inaugurated in eight new areas; and work was suspended in two countries. While varying degrees of success were attained in different fields, the general tendency has been steadily toward a reduction in the prevalence and intensity of the infection, more efficient and more widespread sanitation, an increase in the financial burden assumed by governments, and an education of communities in the possibilities of general public health policies. From the beginning the last named object has been kept steadily in mind by the Board. Hookworm control has proved a most successful means of convincing communities that health is a purchasable thing. Brazil and Australia afford striking examples of the way in which hookworm cam-

paings widen into comprehensive public health programs. In the former country a million dollars has been appropriated for rural sanitation, chiefly as a result of the hookworm work begun in co-operation with the International Health Board.

Lee county, Mississippi, under the leadership of the Department of Rural Sanitation of the State Board of Health, has expanded a hookworm project into a health program which is arousing the enthusiasm of the entire population. Local pride has been stimulated. "The County De Soto was seeking" is one of its health slogans, 4,000 of which were produced by the school children in a county-wide prize competition. "Chew your food; you have no gizzard" won the first prize. Fifteen hundred health slogans greet the traveler from mile-posts which enterprising merchants have installed on the county highways. At the county fair the health exhibit attracted chief attention. The campaign began in July, 1919. During the first three months 2,712 homes were surveyed, 8,907 individuals given physical examinations, 200 vaccinated against typhoid, 1,100 school children medically inspected, an epidemic of scarlet fever was controlled, 30,000 pieces of literature were distributed, and 52 public meetings held. It is said that the establishment of a permanent county health department is assured for the early future.

A feature of the hookworm work of the Board has been the preparation of a bibliography which deals with this disease. The compilation of this material has been in progress for a considerable length of time. It is hoped the completed work, which will be exhaustive in scope, will be published some time in the near future.

No Armistice with Tuberculosis in France

The control of yellow fever, malaria, or hookworm is a relatively simple undertaking compared with the attempt to arrest and prevent the insidious and well-nigh universal ravages of tuberculosis. Only in France—and there as a war measure—has the International Health Board undertaken to aid in combating the white plague, against which so many vigorous agencies, public and private, are enlisted. A campaign begun there in the summer of 1917 aimed, not at an impertinent importation of scientific knowledge into the land of Louis Pasteur, but at the following definite objects: (1) the setting up in typical urban and provincial areas of standard demonstrations of systematic control methods; (2) the training of public health nurses, clinicians, lecturers, and organizers; (3) the arousing of communities to the need of creating local agencies, governmental and voluntary;

(4) the educating of the public in the causes, treatment, and prevention of tuberculosis; (5) the gradual transfer of responsibility to French agencies, and the organization of these agencies on a national basis.

During 1919 appreciable progress was made toward each of these goals. The demonstrations in the 19th arrondissement of Paris and in the department of Eure-et-Loir showed increased efficiency through the consolidation of dispensary service in the urban district and the operation of twenty-two dispensaries scattered throughout the towns, villages, and rural areas. In six nurse-training schools administered by the French, 205 women who held American scholarships were registered. Fifty-one graduated; seventy-six nurses were assigned to various departments. A graduate course on the theory and practice of treating tuberculosis was worked out in co-operation with the Paris Faculty of Medicine and with physicians of the Paris hospitals. A six-weeks' course for physicians on the diagnosis and treatment of tuberculosis was attended by a group of French doctors, twenty-two of whom received scholarships from the Commission of the Foundation.

As a result of extension work, dispensaries were opened in three of the departments in the devastated region. Preliminary surveys in

anticipation of work to be undertaken were made in five others. It is worth noting that the Commission reports a more hearty and effective response from the people of this region than from communities in other parts of France. In fourteen departments new committees were organized, and in twelve others preliminary arrangements were made. Forty-two new dispensaries were built, thirty-six were in process of construction, and plans for fifty-two more had been made. The program of popular health education with special reference to tuberculosis is described in a subsequent paragraph.

The French Assuming Responsibility

The process of transferring responsibility to French communities and agencies has gone forward steadily. The personnel in charge of the dispensaries is now almost wholly French. In the Paris demonstration, for example, there is not one American on the staff. During the war the American Red Cross provided on a generous scale hospital and sanitarium facilities for the tuberculous. This service has been taken over and extended by municipalities and departments. The central government has passed a law under which each department will be compelled within five years either to build a sanitarium of its own or to send its patients to that of another depart-

ment. The cost of construction is to be shared equally by the central and the departmental governments. In the departments in which the Commission organized new dispensaries in 1919, the funds provided by government councils amounted to \$713,000. The Eure-et-Loir agreed to assume all local dispensary costs for 1920. Not only have departmental committees been formed throughout France, but a National Committee which originally concerned itself only with tuberculous soldiers has been re-organized and henceforth will be known as the National Committee of Defense Against Tuberculosis. This body has agreed to supervise and direct the entire national anti-tuberculosis campaign.

A significant feature of the Commission's activities has been the development of community spirit as a result of the formation of committees to carry on the tuberculosis work. All over France, individuals and groups formerly sharply divided by social distinctions, religious differences, and political partisanship have been drawn together in loyalty to a common cause, and have come to understand and respect one another. In a town where animosity had been bitter and the prospects of co-operation seemed remote, the American representative, by tact, patience, and persistence, finally brought about

a large measure of concord and good will. Some time later a leading citizen of the town wrote this gracious sentence: "You have taught us that not only tuberculosis is contagious."

A Prophylactic Punch and Judy

One of the most serious obstacles encountered in France is the almost superstitious popular dread of tuberculosis. The word itself has been avoided. The disease has been regarded as incurable. Disgrace and despair have been associated with it. People have been reluctant to go to dispensaries lest they might be declared tuberculous or suspected of harboring the dreaded infection. This combination of traditional dread and ignorance had to be attacked boldly and with every resource. Exhibits and groups of lecturers were sent out to visit cities, towns, and villages. Mass meetings with addresses, slides, and motion pictures were organized. Attractively written and whimsically illustrated pamphlets were widely distributed. Striking posters called from walls and boardings. Series of articles were syndicated through the newspapers. Simple textbooks were put in the hands of school children, together with ingenious health games and amusing picture post-cards.

To its educational devices, the Commission added in 1919 the *Guignol*, the French Punch

and Judy, which was seen by 67,000 children. A writer in *L'Avenir* for January 12, 1920, gives this vivacious account of the experiment:

"Aunt Clotilde, don't make the microbes fly about. You must dampen the floor before sweeping."

"If you bring home cakes, don't buy those which are outside. You know that the tuberculosis microbes are walking around on them."

These two phrases were spoken, one by a *child* of six, the other by a little girl of seven. The mistress of their school heard them and repeated them to me. And this advice to Aunt Clotilde and this warning to the big brother who is going to buy cakes came from two children who, some days before, had seen in their school the Punch and Judy show of the American mission.

The "Commission Américaine de Préservation contre la Tuberculose en France" has had a little Punch and Judy built like the ones of the Champs-Élysées. M. Henri de Gressigny has written a piece for the wooden actors, and himself works the puppets and makes the conversation of the heroes of his little drama. A few days ago the Punch and Judy was at Paris, in a school of the 19th arrondissement. At present it is at Lyons. The piece has been played in thirty departments. Thousands and thousands of children have heard it. The plot does not pretend to equal that of King Lear. The psychology does not attempt that of "L'Âme en Folie." A little boy on his way to school meets a little girl in the street. The boy starts to talk of hygiene. "Do you know what a microbe is?" he asks the little girl. "Yes, it is a big animal," she answers. Then the boy explains how microbes are spread, by dust, by dirt, by overheated air, etc. He also tells how to avoid them. A soldier appears who teaches them how to keep

the house clean, how to air it, etc. While he is speaking a drunken man reels in, who shocks the children. The soldier scolds the drunkard; "You mustn't drink alcohol." At this moment the drunkard falls down. "See what becomes of a man who drinks!" says the little girl with great scorn. "We must not imitate him, we must take care of ourselves, for we are necessary to France." With these noble and generous words the curtain falls!

During the year 1919 the Commission's exhibits visited, in twenty-eight departments, 293 towns with a combined population of 3,000,000. Of this total population, 700,000 persons were reached directly. More than 1,400 talks were given in public schools. Many facts and pictures were inserted in 900,000 almanacs. Three million pieces of literature were distributed. A good beginning has been made in directing the attention of the French people to the importance of health, and especially to the menace of tuberculosis.

A West Point for Health Officers

Convinced by its own experience that there is a lack of trained men and women for health work, the Foundation offered in 1916 to establish at Johns Hopkins University a School of Hygiene and Public Health. Two years later the school opened with a faculty of thirty and with eighteen students. In 1919 these numbers rose to thirty-six and eighty-two, respectively. The courses

vary in length from two years for the degree of Doctor of Public Health, to a period of six weeks for officials in active service and for physicians who expect to enter part-time public health work. During the year the school not only gave instruction and encouraged research in a wide range of fundamental sciences, but also established relationships with the community and the field. A course of public addresses was given by a number of men eminent in preventive medicine. A series of lectures on Problems of Motherhood was offered in co-operation with the Maryland Division of the National Congress of Mothers. The Department of Public Health Administration of the school arranged to give students practical experience in the health departments of Baltimore and of the state of Maryland. Co-operation of the United States Public Health Service was secured. Significant demonstrations in nutrition were conducted in connection with an orphan asylum and in the public schools of Baltimore. The Department of Vital Statistics was asked by the United States authorities to make a statistical analysis of the influenza epidemic of 1918. The same division also undertook an intensive study of tuberculosis in a limited group at the request of the National Tuberculosis Association. The new school already has made measurable progress in its three

chosen fields: professional training, scientific research, and popular education.

Western Medicine in China

In the introduction of the theory and practice of modern medicine among the Chinese, Japanese influence has been direct and important. For the most part the government and provincial medical schools have been staffed by Japanese-trained Chinese, together with considerable numbers of Japanese teachers. A large majority of the native physicians who profess to practice Western medicine have been trained in Japan. Unfortunately, with few exceptions these Chinese medical students have resorted to special schools which are not fully recognized by the Japanese Government. It is even asserted that the tests applied to Chinese graduates have been lenient. The Chinese medical schools and hospitals suffer from lack of well-trained staffs, absence of adequate laboratory and hospital facilities, the intrusion of political and social influences, and the generally disturbed condition of the country. In a few cases there are hospitals under Chinese control which approach average Western standards.

An appreciable educative effect upon Chinese public opinion has been exerted by a Japanese medical school in Moukden, by what was until recently a German-manned school in Shanghai,

by a British medical school in the University of Hongkong, by groups of European and American physicians in the chief Treaty ports, by hospitals supported by local town councils or voluntary societies in foreign concessions, and by military and naval hospitals maintained by various foreign governments. The influence of Chinese physicians who have been trained in the medical schools of the United States and of Europe has also been significant and of increasing weight.

Missionary societies have played a leading part in introducing a knowledge of modern medicine into communities scattered throughout the entire Republic. Dispensaries, begun as adjuncts of evangelistic work, have in many cases developed into small hospitals, in a few instances in larger centers into institutions comparable with the average of those in the West. In 1919 the Protestant missions in China supported 317 hospitals. Catholic orders and societies maintain hospitals and dispensaries in large ports, such as Shanghai and Hankow, and in several smaller places.

The need for Chinese assistants in these missionary hospitals led to the opening of pioneer medical schools, which, through the devotion of the teachers, were able to give a preliminary training of practical use in the routine of the

hospital. Some of the students of exceptional ability made considerable progress. A few were sent to Western schools to complete their training. Of late, missionary medical education has been concentrated in a few schools.

The Chinese National Medical Association, composed of Chinese with modern training, and the China Medical Missionary Association, are professional organizations which seek to advance the interests of dispensary and hospital service, of medical training and research, of professional standards, and of public health policies in China. The latter society has rendered substantial aid to medical missions by fixing a minimum standard of personnel equipment, and so forth, for a missionary medical school, by its advice concerning the number and distribution of such schools, by co-operating in the translation of medical works into Chinese, by a survey of missionary hospitals, and in various other ways.

A Modern Medical Center in Peking

The China Medical Board of the Foundation seeks to aid the agencies which represent Western medicine in China to make steady progress toward higher standards and more efficient service. In fulfilling its purpose to promote modern medical education in the Republic the Board recognizes the following essentials:

(1) pre-medical education; (2) undergraduate courses for physicians; (3) graduate study for investigators, laboratory workers, teachers, and clinical specialists; (4) short courses for private practitioners and missionary doctors, both foreign and Chinese; (5) medical research, especially with reference to the problems peculiar to the Far East; (6) standardized hospitals as training centers for internes, as models for imitation by the Chinese, as headquarters for practicing physicians, and as a means of popular education; (7) organized efforts to diffuse among the Chinese a knowledge of modern medicine and public health; and (8) the fostering of professional ethics through the development of character and idealism.

The chief agency by which it is hoped to further these aims is the Peking Union Medical College, which has recently been opened in the Chinese capital. Controlled by a Board of Trustees who are chosen by the Rockefeller Foundation and by six co-operating missionary societies, American and British, the Peking institution is being built and maintained by Foundation funds. The completed plant will include laboratories for anatomy, physiology, and chemistry, a pathology building, a 250-bed hospital with provision for about thirty private rooms, a large out-patient department,

a hospital administration unit with quarters for resident physicians and internes, a nurses' home, an animal house, and plants which will supply water, heat, electric light and power, and fuel gas. The faculty residences, with a few exceptions grouped in two walled areas or compounds, are of brick and concrete with slate roofs, and are supplied with every convenience of Western life. The medical and hospital buildings, which are fire-proof, embody certain characteristic features of Chinese architecture. The roofs are covered with glazed green tiles made in one of the factories which once supplied tiles for the imperial palaces. Eaves and porticoes are embellished with conventional Chinese decorations in red, blue, green, and gold, painted by native artizans. Three of the teaching buildings were occupied in October, 1919. It is expected that the entire plant will be completed by January 1, 1921.

During the autumn of 1919, sixty-one students were registered: thirty-two in the pre-medical school, seven in the first year of the undergraduate medical course, and twenty-two as graduate students and internes. Of the faculty of forty, thirty were in Peking, and the remainder, chiefly representatives of the clinical branches, were completing special graduate studies in the United States. A superinten-

dent of nurses and eight nurses were in Peking preparing for the opening of a thorough course for the training of young Chinese women as hospital and public health nurses. Women are admitted to both the pre-medical school and the medical courses on equal terms with men. Chinese are appointed to the teaching staff, which is expected to include steadily increasing numbers of native teachers and investigators. Graduate students are welcomed, and with the opening of the new hospital will be offered excellent opportunities to pursue both laboratory and clinical studies under well-trained and enthusiastic teachers. Special efforts will be made to put the resources of the school and hospital at the service of medical missionaries and other doctors who wish to keep abreast of progress in medicine and surgery, or to undertake specific investigations. Short courses of six weeks or more will be given in the summer, and possibly during the Chinese New Year season.

Helping Pre-Medical Schools and Hospitals

Until a sufficient number of secondary or "middle" schools in North China can give satisfactory training in the pre-medical sciences of physics, chemistry, and biology, as well as in English and French or German, the Peking Union Medical College will continue to offer this pre-

liminary training. In central and southern China it has been deemed best to assist certain well-established institutions which are offering pre-medical courses, by appropriations toward laboratories, equipment, and maintenance. During 1919 such aid was given to two institutions: St. John's University, Shanghai, and Fukien Christian University, Foochow. Appropriations were also made toward the current support of medical schools in Shantung Christian University, Tsinan-fu, and in the Hunan-Yale College, Changsha.

Appropriations were made during the year to nineteen hospitals conducted under the auspices of missionary societies. In each case the amount given by the China Medical Board was supplemented by mission funds and was used to increase the staff, or to provide additional buildings or equipment. In December, 1919, the Board, in the light of five years' experience in co-operating with hospitals, adopted a somewhat revised policy for the future. This includes concentration upon a small number of hospitals of the better type, which by reason of location, staff, and equipment are in a position to promote directly the cause of medical education.

Although the instruction in the Peking Union Medical College is conducted in the English language, the Board recognizes the importance

of translating standard medical works into Chinese, for use in Chinese medical schools and in missionary schools which teach in the Mandarin. An annual appropriation is made to the Publication Committee of the China Medical Missionary Association, which supervises translation work.

A further form of assistance to Chinese medical education has been the granting of fellowships and scholarships to Chinese to enable them to study medicine in the United States, and to missionary doctors who, during their furloughs at home, wish to pursue graduate courses or attend special clinics. When the college in Peking is fully under way the need for the first type of fellowships will largely disappear. To a considerable degree, also, medical missionaries will resort to Peking for opportunities which heretofore they have been able to secure only when at home on leave.

Aid to Canadian and Other Medical Schools

In transmitting his gift of December, 1919, the Founder made the following statement:

My attention has been recently called to the needs of some of the medical schools in Canada, but as the activities of the General Education Board are by its charter limited to the United States I understand that no part of that gift may be used for the Canadian schools. The Canadian people are our near neighbors. They are closely

bound to us by ties of race, language, and international friendship; and they have without stint sacrificed themselves—their youth and their resources—to the end that democracy might be saved and extended. For these reasons, if your Board should see fit to use any part of this new gift in promoting medical education in Canada, such action would meet with my very cordial approval.

At a subsequent meeting of the Foundation, the sum of \$5,000,000 was set aside for use in Canada. The officers were instructed to make a careful study and to confer with Canadian medical school authorities, government officials, and other citizens with a view to making recommendations as to the distribution of this appropriation.

In order to provide expert direction for the growing work of the Foundation, the Board created a Division of Medical Education and appointed as Director, Dr. Richard M. Pearce, Professor of Experimental Medicine in the University of Pennsylvania Medical School. Dr. Pearce in 1919 made his third trip to South America under Foundation auspices to survey medical schools. It was in connection with an earlier visit that he arranged for the co-operative establishment of a Department of Public Health in the Medical School of the University of São Paulo, Brazil. In a similar way a Department of Pathology in the Oswaldo Cruz Institute is being aided. In December, the new Director of the

Division of Medical Education and the Director of the International Health Board sailed for England and Belgium to study certain phases of medical education and public health administration.

International Fellowships and Scholarships

During the year 1919 the Foundation provided fellowships and scholarships for eighty-five persons who were in residence in universities in the United States. Fifty-seven came from China, twelve being Chinese doctors, eight Chinese medical students, seven Chinese nurses, twenty-six medical missionaries on furlough, and four prospective appointees to the Board's teaching staff in China. Five doctors from Brazil, one from Salvador, and four from Czechoslovakia pursued courses in public health. Five American physicians held fellowships in the same field. The Foundation also supported thirteen research fellows in physics and chemistry, who were selected and supervised by a special committee of the National Research Council. The obvious fact that the successful extension of scientific research, medical education, and public health work is dependent upon discovering exceptional individuals and giving them the best available training makes this plan of granting fellowships clearly a sound and funda-

mental policy. The Foundation does not create inflexible fellowship systems, but is guided solely by the possibility of finding unusual persons who give distinct promise of promoting the end in view. The international implications and consequences of sending students from one country to another for purposes of study and research need not be amplified.

The Post-War Situation in Europe

Aside from its anti-tuberculosis work in France and its final payments on war work appropriations made in 1918, the Foundation had no direct part in relief and reconstruction activities in Europe in 1919. The American Relief Administration, the American Red Cross, the League of National Red Cross Societies, the Near East Relief, the Jewish Joint Distribution Committee, and many other societies have been engaged in direct relief in various parts of Europe and the Near East. The officers of the Foundation were throughout the year in constant communication with these agencies; they received reports from the chief European centers; and they conferred frequently with returned officials and with other first-hand observers. Two members of the central staff were sent abroad on a special mission. The constant aim was to gather information and to be ready to co-operate as soon as conditions

permitted the undertaking of work of the kind in which the Foundation feels especially fitted to participate.

Sundry Items of Aid and Service

From time to time the Foundation provides funds to standing or special committees for surveys or studies. Under the auspices of the Public Health Committee of the New York Academy of Medicine a study was made of the dispensaries of New York City. This brought to light many significant facts. Serious defects with which the medical profession and social workers have in a general way been familiar were displayed statistically and clearly. A special committee on the training of public health nurses was organized from a group of persons especially interested in the problem. With the aid of an appropriation from the Foundation, this Committee is making a survey and will report recommendations. During 1919 the Foundation continued to support studies carried on under the auspices of the National Committee for Mental Hygiene. Members of the Foundation staff assisted in the formulation of a health center program for Halifax, participated in a study of public health administration in Massachusetts, conferred with health officials in all parts of the country, conducted a large correspondence of information and suggestion, gave

addresses before a wide range of audiences, and in many other ways made contributions within the special fields of Foundation work.

Finances for 1919

The table on page 49 presents a summary of receipts and expenditures for the fiscal year 1919.

The income from invested funds was approximately \$7,000,000. The balance of \$5,000,000 carried over from 1918 was largely mortgaged by pledges made in that year but not payable until 1919. This applies also to the balance of \$4,500,000 carried forward into 1920, of which over \$3,000,000 had been pledged but was not due. Tables on pages 59, 60, and 61 give a complete list of the expenditures made during 1919 for all purposes, while the Treasurer's report, pages 345 to 406, contains a full statement with all details as to investments, other property, income, and expenditures of the Foundation.

On Christmas Day, 1919, announcement was made of a new gift of \$50,000,000 from Mr. John D. Rockefeller, who wrote: "I am greatly interested in the work which is being done throughout the world in combating disease through the improvement of medical education, public health administration, and scientific research." This addition to the Foundation's resources will enable it more adequately to meet the

large demands of a world-wide program which already reaches twenty-five foreign countries.

The Health of the Nations

The war against disease is a world war. Commerce carries dangerous infections, as well as goods and ideas. The health problems of the remotest land concern all peoples. More and more, nations are coming to recognize their inter-dependence in health as in industry, government, science, and culture. There are even now foreshadowings of world-wide co-operation in combating the maladies which have long threatened humanity. For this new campaign, leaders are needed to extend the frontiers of medical science, to teach, to organize, to administer. Demonstrations are required to convince communities and nations that diseases can be controlled and even eradicated. The Rockefeller Foundation, enlisted for this world-wide campaign against disease, is co-operating with many agencies in five continents, is fostering the growth of international confidence and good will, and is seeking the fulfillment of its chartered purpose—"to promote the well-being of mankind throughout the world."

THE ROCKEFELLER FOUNDATION

Report of the Secretary

To the President of the Rockefeller Foundation:
Sir:

I have the honor to submit herewith my report on the activities of the Rockefeller Foundation for the period January 1, 1919, to December 31, 1919.

Respectfully yours,

EDWIN R. EMBREE,

Secretary.

SECRETARY'S REPORT

The review by the President outlines the policies by which the Rockefeller Foundation is being guided in its work, sketches its present program, and describes the results aimed at and accomplished during the year 1919. The following report depicts the organization and the agencies through which these results were reached, and outlines the methods by which the programs of the several departments were carried out.

Organization and Agencies

The following are the members and the principal officers of the Rockefeller Foundation:

MEMBERS

John G. Agar	Starr J. Murphy
Wallace Buttrick	John D. Rockefeller
Harry E. Fosdick	John D. Rockefeller, Jr.
Simon Flexner	Wickliffe Rose
Frederick T. Gates	Julius Rosenwald
A. Barton Hepburn	Martin A. Ryerson
Charles E. Hughes	Frederick Strauss
Harry Pratt Judson	George E. Vincent

EXECUTIVE COMMITTEE

George E. Vincent, <i>Chairman</i>	
Wallace Buttrick	Starr J. Murphy
Simon Flexner	Wickliffe Rose
Edwin R. Embree, <i>Secretary</i>	

OFFICERS

John D. Rockefeller, Jr.	<i>Chairman of the Trustees</i>
George E. Vincent	<i>President</i>
Edwin R. Embree	<i>Secretary</i>
Richard M. Pearce	<i>Director of the Division of Medical Education</i>
L. G. Myers	<i>Treasurer</i>
Robert H. Kirk	<i>Comptroller</i>

The Foundation holds regular meetings in February, May, and December. The Executive Committee meets frequently during the intervals to execute programs within general policies approved by the Trustees.

Departmental Boards

The Foundation accomplishes its work largely through its subsidiary or departmental organizations, which are devoted to special functions, and which depend upon the Foundation for funds. These with their officers and members are:

INTERNATIONAL HEALTH BOARD

George E. Vincent, <i>Chairman</i>	
Hermann M. Biggs	Starr J. Murphy
Wallace Buttrick	John D. Rockefeller, Jr.
Simon Flexner	Wickliffe Rose
Frederick T. Gates	William T. Sedgwick
William C. Gorgas	Victor C. Vaughan
Edwin O. Jordan	William H. Welch
Edwin R. Embree, <i>Secretary</i>	
Wickliffe Rose	<i>General Director</i>
John A. Ferrell, M.D.	<i>Director for the United States</i>
Victor G. Heiser, M.D.	<i>Director for the East</i>
H. H. Howard, M.D.	<i>Director for the West Indies</i>
Linsly R. Williams, M.D.	<i>Director of the Commission for the Pre- vention of Tuberculosis in France</i>
Ernst C. Meyer	<i>Director of the Department of Surveys and Exhibits</i>

CHINA MEDICAL BOARD

George E. Vincent, <i>Chairman and General Director</i>	
Roger S. Greene, <i>Resident Director in China</i>	
Wallace Buttrick	Starr J. Murphy
Simon Flexner	Francis W. Peabody
Frederick L. Gates	John D. Rockefeller, Jr.
Frank J. Goodnow	Wickliffe Rose
Harry Pratt Judson	William H. Welch
	John R. Mott
	Edwin R. Embree, <i>Secretary</i>
	Margery K. Eggleston, <i>Assistant Secretary</i>

Assistance to Other Agencies

In addition to the work carried out through the departmental organizations described above, the Rockefeller Foundation has contributed during the year to the accomplishment of work undertaken by other and unaffiliated organizations.

The work of the year, whether through its own agencies or by assistance to unaffiliated organizations, has been chiefly within three fields: war work, public health, and medical education.

On pages 59 to 62 will be found a summary of payments made by the Rockefeller Foundation for all purposes during the year 1919. This tabular summary outlines, in terms of expenditures, the work described in terms of aims and results in the President's review. In many instances these payments involved sums expended on account of appropriations made in former

years. On the other hand, they represent in some instances but partial payments on many of the appropriations, made during 1919, which will provide for continuing work during succeeding years. For a full statement of the finances of the Foundation, see the Report of the Treasurer, pages 345 to 406.

TABLE 2: EXPENDITURES OF THE ROCKEFELLER FOUNDATION FOR THE YEAR 1919

I. PUBLIC HEALTH

A. International Health Board

1. Hookworm, Malaria, and Yellow Fever Control	\$694,380
2. Tuberculosis in France	442,281
3. Fellowships and Public Health Education	22,874
4. Administration	78,307

B. Studies and Demonstrations

1. Mental Hygiene	33,354
2. After-Care of Infantile Paralysis	6,543
3. Committee for Study of Public Health Nursing	4,064
4. National Organization for Public Health Nursing (Payment on two-year pledge made in 1917)	10,000
5. Committee for Survey of Conditions and Possible Co-operation in Care of Crippled Children in New York	482
(Payment on pledge of \$7,500 toward a fund of \$10,000)	
6. Public Health Committee of New York Academy of Medicine	9,833
(For a study of dispensary service of New York City)	

C. School of Hygiene and Public Health of Johns Hopkins University

165,595

\$1,467,713

II. MEDICAL EDUCATION AND RESEARCH

A. China Medical Board

1. Peking Union Medical College	
(a) Land and Buildings	2,453,458
(b) Operation	355,166
2. Other Medical and Pre-medical Schools	119,617
3. Hospitals	131,352
4. Fellowships and Scholarships	39,569
5. Miscellaneous	7,142
6. Administration	65,550

B. Rockefeller Institute for Medical Research, Current Expenses

30,598

C. University of Chicago, Interest on Pledge

35,394

D. Study of Medical Education in South America

10,701

\$3,248,547

III. WAR WORK

(Payments on previous pledges)

A. Camp and Community Welfare

1. United War Work Fund	\$2,500,000	
(Seven co-operating agencies)		
2. American Social Hygiene Association	115,866	
3. Commission on Training Camp Activities	10,000	
(Auxiliary fund)		
		<hr/>
		\$2,625,866

B. Medical Research and Relief

1. National Committee for Mental Hygiene	18,916	
2. National Research Council—Division of Medicine and Related Sciences	6,313	
3. Rockefeller Institute for Medical Research	70,752	
(War Demonstration Hospital and Medical Research)		
		<hr/>
		95,981

C. Humanitarian Aid

1. American Red Cross	51,000	
(Care of Belgian Children in Switzerland)		
		<hr/>
		51,000

Total War Work		<hr/>	\$2,772,847
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IV. MISCELLANEOUS

(Chiefly payments on previous pledges)

A. American Academy in Rome	10,000
(Payment on ten-year pledge made in 1914)	
B. Bureau of Municipal Research	25,000
(Payment on five-year pledge made in 1915)	
C. Committee of Reference and Counsel of Annual Foreign Missions Conference of North America	45,000
(Payment on ten-year pledge made in 1914 for correlating educational work in foreign fields)	
D. National Research Council	13,698
(For Fellowships in Physics and Chemistry)	

E. New York Association for Improving the Condition of the Poor.....	\$25,000	
(Payment on ten-year pledge made in 1914 for demonstration of social relief measures)		
F. Grand Chenier Bird Refuge—taxes and expenses.....	634	
(Purchased in 1914 and supervised by Louisiana Department of Con- servation)		
	<hr/>	\$119,332

V. ADMINISTRATION

A. Maintenance of Executive Offices and Treasurer's Office.....	145,056	
B. Books and Furniture.....	6,860	
	<hr/>	151,916
		<hr/>
		\$7,760,355

Funds and Property

The book values of the principal funds of the Foundation, which were invested in stocks and bonds, as of December 31, 1919, were:

General Fund.....	\$171,204,624
Other Funds:	
Estate of Laura S. Rockefeller Fund.....	152,733
Reserve (including balance for 1919 and gain on securities, set aside to meet future possible losses)	2,712,671
Special Designated Funds:	
Gift of John D. Rockefeller.....	\$37,000
Gift of Laura S. Rockefeller.....	49,300
Henry Sturgis Grew Memorial Fund.....	25,000
Arthur Theodore Lyman Endowment....	5,500
	<hr/>
	116,800
	<hr/>
	\$174,186,828

The value of the Foundation's lands, buildings, and equipment, as of December 31, 1919, was:

In China: Medical School Lands, Buildings, and Equipment.....	\$4,733,521
In Louisiana: Land for Bird Refuge purchased and now held as a Preserve under State Conservation Commission.....	243,999
In New York: Furniture and Equipment of Offices....	16,945
	<hr/>
	\$4,994,465

Undisbursed income held on December 31, 1919, was:

Balance payable on previous appropriations.....	3,278,856
Special Accounts:	
Estate of Laura S. Rockefeller Fund Income.....	\$49,763
Henry Sturgis Grew Memorial Fund Income.....	1,885
Arthur Theodore Lyman Endowment.....	217
	<hr/>
	51,862
	<hr/>
	\$3,330,718

INTERNATIONAL HEALTH BOARD
Report of the General Director

INTERNATIONAL HEALTH BOARD

Report of the General Director

To the President of the Rockefeller Foundation:
Sir:—

I have the honor to submit herewith my report as General Director of the International Health Board for the period January 1, 1919, to December 31, 1919.

Respectfully yours,
WICKLIFFE ROSE,
General Director.

INTERNATIONAL HEALTH BOARD

OFFICERS AND MEMBERS

GEORGE E. VINCENT, *Chairman*

WICKLIFFE ROSE, *General Director*

HERMANN M. BIGGS

WALLACE BUTTRICK

SIMON FLEXNER

FREDERICK T. GATES

WILLIAM C. GORGAS¹

STARR J. MURPHY

JOHN D. ROCKEFELLER, JR.

WILLIAM T. SEDGWICK

VICTOR C. VAUGHAN

WILLIAM H. WELCH

EDWIN R. EMBREE, *Secretary*

¹ Deceased July 4, 1920

PERSONNEL OF STAFFS DURING 1919†

ADMINISTRATIVE STAFF

WICKLIFFE ROSE, *General Director*

JOHN A. FERRELL, M.D., *Director for the United States*

VICTOR G. HEISER, M.D., *Director for the East*

HECTOR H. HOWARD, M.D., *Director for the West Indies*

W. PERRIN NORRIS,* M.D., *Associate Director for the East*

L. W. HACKETT, M.D., *Associate Regional Director (for
Brazil)*

ERNST C. MEYER, *Director of Surveys and Exhibits*

FIELD STAFF

HOOKWORM

AUSTRALIA

W. A. Sawyer

G. P. Paul

S. M. Lambert*

BRAZIL

L. W. Hackett

J. L. Hydrick

Alan Gregg

BRITISH GUIANA

F. W. Dershimier

CEYLON

W. Perrin Norris*

W. P. Jacocks

S. A. Winsor*

CHINA

F. C. Yen*

J. B. Grant

COSTA RICA

L. Schapiro

GUATEMALA

J. L. Rice

W. T. Burres

E. I. Vaughn*

JAMAICA

P. B. Gardner

KENTUCKY

P. W. Covington

NICARAGUA

D. M. Molloy

NORTH CAROLINA

B. E. Washburn

PANAMA

F. A. Miller

†Personnel employed by Government in co-operative work not listed

*Special Staff Member

SALVADOR
SEYCHELLES
SIAM
TRINIDAD

C. A. Bailey
J. F. Kendrick
M. E. Barnes
G. C. Payne
R. B. Hill

MALARIA

ALABAMA
ARKANSAS

ECUADOR
GEORGIA
MISSISSIPPI

TEXAS

E. B. Johnson*
W. H. Bryce-Delaney*
A. E. Gorman*
H. W. Green*
L. D. Mars*
H. A. Taylor
M. E. Connor
H. N. Old*
C. C. Bass*
R. D. Dedwylder*
H. H. Howard
E. H. Magoon*

YELLOW FEVER

YELLOW FEVER COMMISSION

W. C. Gorgas,* *Chairman*
T. C. Lyster*
W. Pareja*
Hideyo Noguchi*
Israel Kligler*
W. D. Wrightson*

ECUADOR
SALVADOR
GUATEMALA

M. E. Connor
C. A. Bailey
E. I. Vaughn*

TUBERCULOSIS

TUBERCULOSIS IN FRANCE

Linsly R. Williams,* *Director*
B. L. Wyatt*
Selskar M. Gunn*
Alexandre Bruno*
F. Elizabeth Crowell*

*Special Staff Member

SPECIAL

SCHOOL OF HYGIENE AND PUBLIC HEALTH, SÃO PAULO

S. T. Darling,* *Professor of Hygiene and Public Health*

W. G. Smillie, *Associate Professor of Hygiene and Public Health*

ADVISER IN MEDICAL EDUCATION

R. M. Pearce*

IN TRAINING

F. C. Caldwell

J. H. Hamilton

W. C. Hausheer

J. W. Visher

C. H. Yeager

*Special Staff Member

INTERNATIONAL HEALTH BOARD

The work of the International Health Board began in the year 1914 with the extension into foreign lands of the measures for the control of hookworm disease which had been under way for a number of years in the Southern States of the American Union. The first of these foreign countries was British Guiana. Each succeeding year has been marked by a steadily widening range of operations. Governments in all parts of the world have invited the Board to enter with them into crusades for better health. In response to these requests, hookworm demonstration campaigns have been organized in Central and South America, in Europe, Asia, and Australia, and in the West Indian and South Sea Islands. Meanwhile the work in the United States has been continued and expanded.

Extension of Activities

The regular co-operative program of the Board was enlarged during the year 1919 to include the activities enumerated on pages 72, 73, and 74. During recent years, in addition, the Board has been more and more frequently called upon to participate in public health and related matters, and to furnish information bearing on these topics. Cities, towns, states, and countries, as

well as public or semi-public organizations and officials, are availing themselves of the facilities which the Board has to offer. Service of this kind is in keeping with the established policy of the Board: namely, to co-operate with governments throughout the world in demonstrating the feasibility and economic value of preventive measures against disease, and thus to aid in creating, in the various countries, popular interest in and support for public health work.

Main Features of the 1919 Work

All of the work during the year 1919, as in preceding years, was conducted in close association with governmental agencies. The activities enumerated below were the chief features of the program:

1. Demonstrations in malaria control through anti-mosquito measures were continued in ten towns in Arkansas.
2. A program was developed, surveys were made, and a staff was recruited for extending the Arkansas type of demonstrations in malaria control (through anti-mosquito measures) to nine additional southern states.
3. Further research into the problem of malaria control through anti-mosquito measures at scattered farm homes was conducted in Hinds county, Mississippi. Special studies were made of the top minnow as a means of preventing mosquito-breeding.

4. Investigation of the feasibility of controlling malaria through the treatment of carriers was continued, under slightly varying conditions, in Sunflower county, Mississippi.
5. Systematic efforts to eradicate yellow fever from Guayaquil, Ecuador, proved successful.
6. Outbreaks of yellow fever infection in Nicaragua, Honduras, and Salvador were suppressed.
7. The etiology of yellow fever was subjected to further scientific study.
8. Plans were matured for a comprehensive attack on yellow fever in its remaining endemic centers.
9. The campaign against tuberculosis in France was extended.
10. Measures were continued for the control of hookworm disease in twelve southern states and in sixteen foreign states or countries.
11. Anti-hookworm measures were begun in four new fields: the state of West Virginia, the island of Jamaica, and the states of Minas Geraes and Paraná in Brazil.
12. Operations under a new public health program were begun in Australia.
13. Preliminary hookworm infection surveys were completed in the states of Minas Geraes and Paraná (Brazil), and at the mines and shipping terminus of the Tayeh Iron and Steel Works in China.
14. Preliminary hookworm infection surveys were undertaken in the states of Maranhão and Santa Catharina (Brazil), in Porto Rico, and in Colombia, South America.
15. The work looking toward the control of hookworm infection at the Pinghsiang Colliery, as a means of

entering the public health field in China, was completed.

16. The Board's staff members at the Department of Hygiene of the Faculty of Medicine, University of São Paulo, Brazil, made valuable field studies in hookworm disease.
17. Studies in public health organization were made.
18. Participation in county health demonstrations in the Southern States was extended.
19. Staff members were lent for special service.
20. Public health fellowships were provided and an organization was developed for selecting persons qualified to receive the grants.

Betterment of Rural Health Conditions

The evolution of simple hookworm posts into effective agencies for conserving public health has been one of the gratifying developments in the Southern States. A county health service with a whole-time health officer at its head has been a goal that has been won for many communities. Demonstrations to show effective methods of relieving hookworm disease gave great impetus to appropriations for health work in general, and led indirectly to the strengthening of state and county health departments. The public began to see that even with modest expenditures of money, disease could actually be prevented.

Plan of Work Pursued by County Health Departments

At the present stage the work essentially provides: (1) an education for every citizen in the fundamentals of health preservation; (2) an accurate health survey of the county as a whole; (3) a health map locating every home, with symbols to show the diseases that have occurred at each home during the past five years; (4) the medical inspection of every school child, with treatment for those who require it; (5) examination for hookworm disease and treatment of the infected; (6) a fly-proof latrine at every home, to prevent soil pollution and its attendant diseases, such as hookworm disease, typhoid fever, diarrhea, and dysentery; (7) infant welfare work; (8) free typhoid and smallpox vaccination; and (9) the establishment of a permanent health department.

There are minor differences in the work which the county health departments conduct in the different states. In North Carolina, life extension work, which contemplates the early detection and treatment of diseases of adult life; the quarantine of infectious diseases; the prevention of tuberculosis; and free dental clinics, are included among the activities undertaken. In some of the states the various activities are not prosecuted simultaneously, but are taken up in

turn. Sometimes the health department centers its energies during the first year of its organization on the prevention of soil pollution, quarantine, and the medical inspection of school children. No rigid order is adhered to in carrying out the different features of the program, but each activity is stressed in turn and each is taken up when the time seems opportune and the conditions favorable for its success.

One of the most valuable features of the work in all the states is the county health survey. This gives the state and county health departments a record of all infections within the county and a clinical history of each individual. The survey includes particulars as to hookworm, malaria, typhoid fever, tuberculosis, and other communicable diseases. In each state the co-ordination of the separate county health departments is effected through a central bureau of county health work, which is located at the headquarters of the state board of health and forms an integral part of that body.

Extent of County Health Work at Close of 1919

North Carolina is among the leaders in county health work. Beginning there in June, 1917, with the organization of a department of health for the county of Wilson, the work has since grown and developed until at the end of 1919



Fig. 2.—Motor clinic used in rural health work, Lee county, Mississippi



Fig. 3.—Side view of rural motor clinic, Fig. 2



Fig. 4.—Dental clinics at rural schools. A prominent feature of county health work in North Carolina

the state had twenty-four counties, embracing 38 per cent of its total population, under whole-time health officers. In fourteen of the counties health departments had been established. To stimulate the county health plan, especially during the formative period, the Board had co-operated with ten states by the end of 1919 in the development of their programs.

Benefits of County Health Work Appreciated

In the state of North Carolina the four most striking effects of the co-operative plan of county health work have been the decrease in the death rate from

soil pollution diseases, the steady increase in the number of counties

providing for whole-time county health officers or county health departments, the new and progressive health legislation enacted in 1919 by the General Assembly of the state, and the widespread recognition by state, county, and municipal officers, by business men, and by the public in general, of the value of the work. The genuine

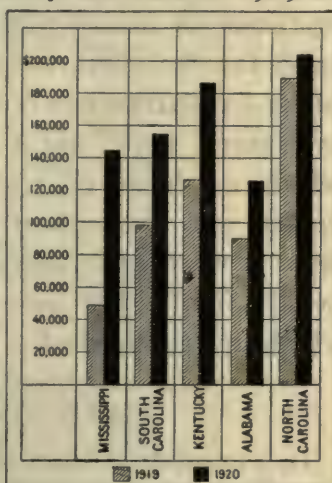


Fig. 5.—Appropriations of legislatures to State Boards of Health for health work exclusive of tuberculosis. Five southern states, 1919 compared with 1920

interest and confidence are further attested by the ever increasing amounts which the legislatures are appropriating for the work. As an instance may be cited the appropriations recently made by the states of Mississippi, South Carolina, Kentucky, Alabama, and North Carolina. Fig. 5 compares, for the five states, the appropriations for health work (exclusive of tuberculosis) for the years 1919 and 1920. The Kentucky legislature has created a special fund for continuing state aid to counties or districts which establish or maintain departments of health, and has authorized the state auditor to draw a warrant in favor of the state board of health for \$2,500 annually for each county which has established a health department.

Rural Sanitation in Brazil

In a number of other countries a similar evolution is taking place. Interest in rural public health work is becoming nation-wide in Brazil. From all parts of the country the Federal Government is being besieged with requests to increase its participation in rural health activities. As a result, it has matured plans for a comprehensive program providing for the organization, with government assistance, of rural sanitary services throughout the republic. During 1919 the states of Rio de Janeiro and Santa Catharina



Fig. 6.—Typhoid vaccination day at schoolhouse in Pine Grove community, Jackson county, Mississippi. One old gentleman said that day, "Doc, you cured us of the terrible hookworm and stamped out smallpox, and now you are stamping out the slow fever. We want all the good things you've got or can get!"



Fig. 7.—Conference of county health officers, state of North Carolina

organized such services with the aid of the Federal Government and of the Board. Their programs include, as the central feature, treatment and control measures for hookworm disease. The plans call also for an attack on other rural disease problems, more especially those presented by malaria.

Development of Public Health Activities in British Guiana

In March, 1914, a co-operative campaign for the control of hookworm disease was inaugurated in British Guiana. With this campaign began a movement for improved sanitation, especially that directed toward the control of soil pollution diseases. For five years, demonstrations in hookworm control, educational work, and efforts to secure sanitary improvement were carried on in numerous villages and rural areas. These operations, however, were greatly hampered by war conditions, and a full realization of the aims of the campaign was of necessity delayed. But throughout this period a leaven was at work, a way was being charted. By the early part of 1919 the results of these years of effort began to make themselves felt. It became evident that British Guiana had caught the spirit of public health reform and had awakened to the need for a wide-spread regulation of the conditions of life with a view to the health and well-being of

the people. In February, the sugar planters of the colony asked Government to extend to their laboring forces the benefits of hookworm treatment and to co-operate in providing proper sanitary conveniences on the plantations and in the surrounding villages. Government promptly adopted a practical working program toward this end and appropriated \$100,000 yearly for five years toward carrying it out.

The organization of a sanitary department is now well under way. In addition to the chief sanitary officer, there are on the staff at present¹ one assistant, three county sanitary inspectors, four district sanitary inspectors, two government disinfecting assistants, and three clerical assistants. The chief officer, his assistant, and the seven inspectors have been trained in England. Each year there are to be added three or more district sanitary inspectors similarly qualified. In addition to these developments \$10,000 was devoted to the sanitary department for special intensive sanitary work; one estate has built a model village in which to house its labor; many other estates are improving their housing facilities and putting in latrine systems and similar conveniences; and the city of Georgetown is planning to install both a modern system

¹ May, 1920

of sewage disposal and a piped water supply. A committee appointed by Government to report on colony drainage is now at work. A conservative estimate of the amount that will be spent in the colony during 1920 by Government, municipalities, and private interests, for the purpose of combating disease and dealing with such problems as drainage, sewage disposal, and water supply, places the sum well in excess of \$200,000. And the work contemplated promises to be of a permanent, substantial character shaped along safe and conservative lines.

Scoring Health Activities

With the rapid increase in the amounts set aside for health work in the various states and countries has arisen a real need for some measure of the value of the results obtained by expenditures for this work. It is not the amount which a state expends in health activities that is of importance, but the kind of trade which it makes—what it obtains for the expenditure. As a means of arriving at an approximate evaluation of the public health operations under way in North Carolina, Dr. W. S. Rankin, State Health Officer, has drafted a plan of scoring, in terms of financial return to the people, the various health measures in operation throughout the state. This scoring method assigns to each

health activity a relative money value. For example, each sanitary latrine is scored as having a value to the community of \$5.00, each hookworm treatment as having a value of \$2.00, and each life extension examination as having a value of \$5.00. The total score for all the health activities of the state during the year 1919 showed an estimated return to the people of \$1,791,210.00 as a result of the expenditure by the State Board of Health of \$437,677.00.

This method of evaluating health measures by showing the return for each dollar expended should be of great aid in stimulating the populace and the officials of the state to an increased interest in health work. It is probable, moreover, that the plan will be adopted by other states and countries and that a measure of comparison will thus be provided which should make for a spirit of friendly rivalry conducive to a rapid and wholesome growth in health activities.

Extension of Malarial Control Program

During the four-year period from 1916 to 1919 inclusive, the Board, in association with governmental agencies, was engaged in a series of field studies in malaria control. These studies were intended to determine the relative efficiency, economy, and feasibility of different methods under various conditions. Certain of

the experimental campaigns have been attended with a large measure of success. They have shown that by simple anti-mosquito measures malaria can be controlled in the average small town of the Southern States at a cost well within

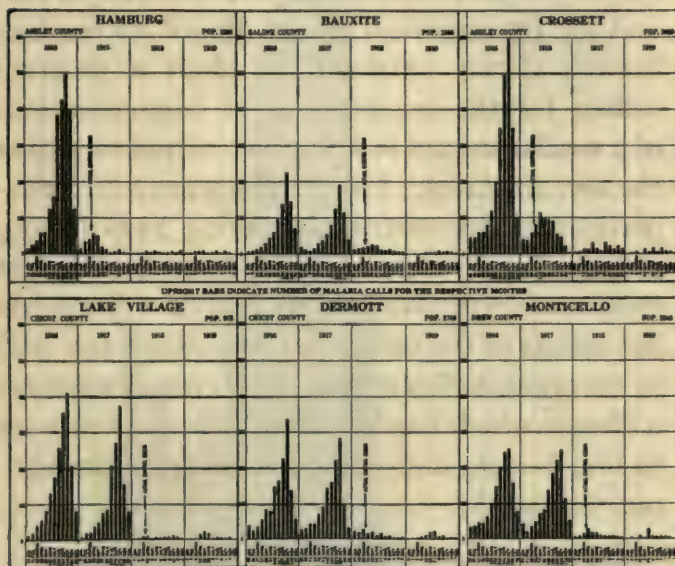


Fig. 8.—Record of malaria control in six Arkansas towns, 1916-1919

the means of the community. And furthermore they have proved that the introduction of anti-malaria measures is economically desirable, in that the results more than justify the expenditure involved. The extra-cantonment anti-malaria measures conducted upon an immense scale by the United States Public Health Service

further emphasized and confirmed the results of the previous studies.

The success of the foregoing control demonstrations led the state boards of health of ten southern states, in association with the United States Public Health Service, selected towns, and the International Health Board, to conduct surveys during 1919 and to adopt a program calling for the organization of demonstrations of a similar nature in a number of towns within the several states. Present plans provide for experimental demonstrations during 1920 in four or more towns in each state. It is hoped that these more extensive field operations will confirm the results of the earlier investigations and lead to the organization of state-wide crusades against a disease which has long been a serious menace to life, health, and economic progress throughout the South.

Stamping Out the Seed-Beds of Yellow Fever

The program for the attack on yellow fever in its remaining endemic centers has been kept steadily in mind. The disease, after being present in Guayaquil for more than a hundred years, was brought under complete control in May, 1919. Notwithstanding this favorable showing, it was considered advisable to continue anti-mosquito measures throughout the year.

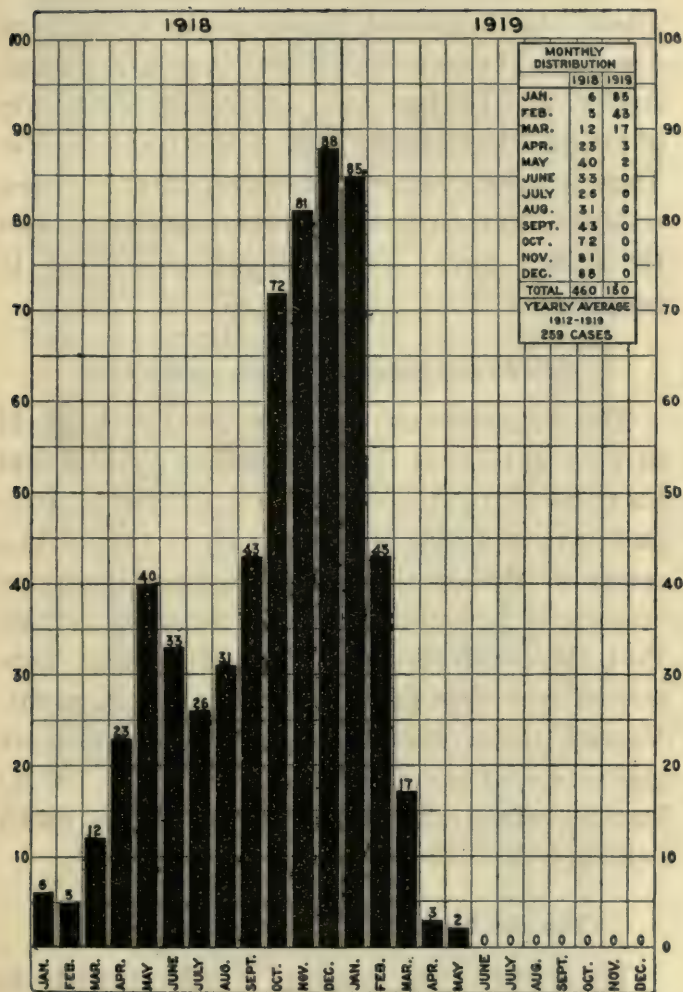


Fig. 9.—One step in the eradication of yellow fever. Disappearance of the disease from Guayaquil, Ecuador, as result of control measures

There still remained the possibility that the disease might be re-introduced from neighboring countries. During the year 1919, outbreaks of yellow fever occurred also in Central America. They were not regarded as likely to create new endemic centers, but for humanitarian reasons the Board gave, upon request, active aid in suppressing them.

Yellow Fever Organism, Vaccine, and Serums

The suggestive spirochete isolated by Noguchi in Guayaquil was further studied by him and his co-workers in Merida, Yucatan, during 1919 and in Peru during the early part of 1920. As a result of this work and of further laboratory studies, it has now become reasonably certain that the organism which Noguchi named *Leptospira icteroides* is the true etiological agent. Vaccine and serums made with the organism are protective in animals, and while their use in human beings has been limited there is much evidence that they have real value.

Countries Visited by Yellow Fever During 1919

The disease was reported during 1919 from Peru and Brazil in South America, from Honduras, Salvador, and Nicaragua in Central America, and from Mexico. Upon the request of the Central American countries, a trained

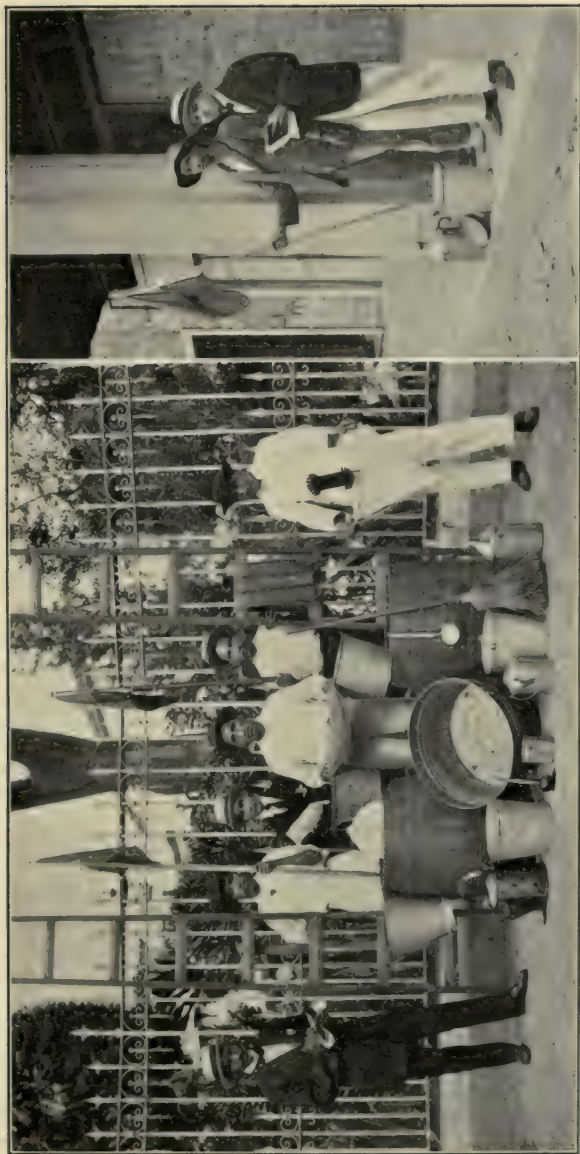


Fig. 10.—Simplification of apparatus and reduction in size of squads. Yellow fever control measures in Guayaquil. December, 1918, and December, 1919

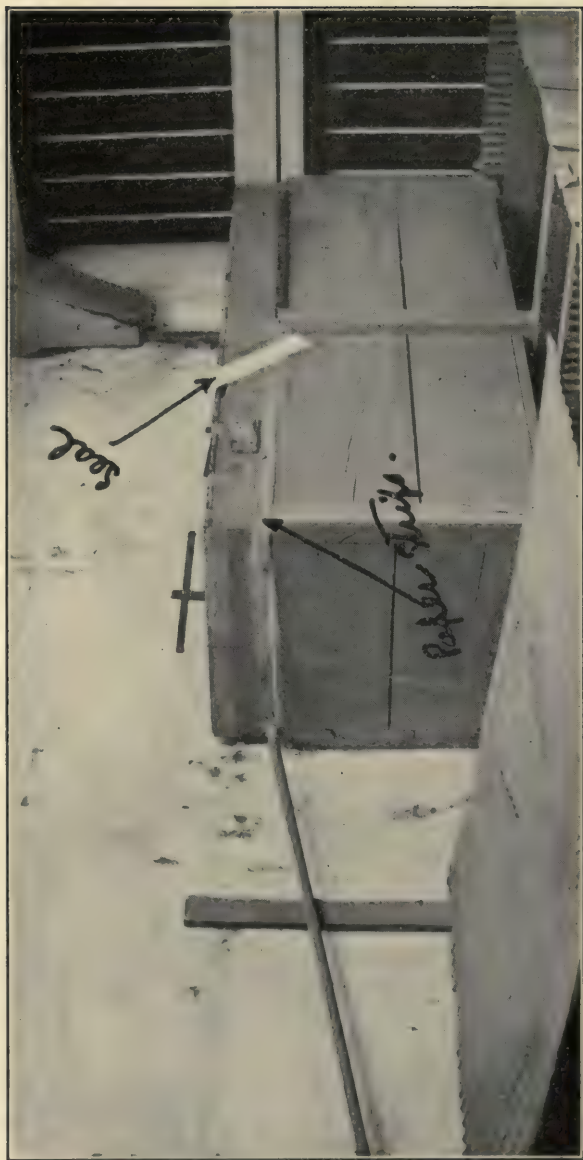


Fig. 11.—Type of tank used for storing water in the municipality of Guayaquil, Ecuador. The solution of the problem of yellow fever control depended very largely upon the prevention of breeding in such tanks. They were fitted with zinc covers and sealed to prevent access of mosquitoes

field force was made available and in the course of a few months the disease was confined to a small number of sporadic cases in Salvador. Until the smouldering flames in the true endemic centers in Mexico and Brazil can be extinguished, local conflagrations caused by sparks of the permanent fires must be expected to occur.

Visit of Inquiry to West Africa

Arrangements for sending to the west coast of Africa a mixed commission, with General Gorgas at its head, to study the disease which in that region is regarded by many as yellow fever, were completed during 1919 with the British and other interested governments. The fact that Noguchi's spirochete has been definitely associated with yellow fever should afford this commission a better opportunity than has heretofore existed for studying the etiology of the disease.

Tuberculosis Work in France

Throughout its two and one-half years of work, the Board's Commission for the Prevention of Tuberculosis in France has directed its efforts toward the realization of a three-fold aim: to demonstrate that tuberculosis, which claims so vast a toll of lives each year, is a curable and preventable disease; to establish a standardized

program for the control of the infection and to secure its uniform operation by government agencies throughout all departments of the country; and to effect the centralization of volunteer anti-tuberculosis work in the hands of a national association, in much the same manner as similar activities in the United States are unified under the National Tuberculosis Association.

Outstanding Developments During 1919

Great forward strides were made during 1919 in anti-tuberculosis work throughout all France. By the end of the year dispensary organization had been completed in twenty-one of the departments of the country, and educational campaigns against tuberculosis had been conducted throughout twenty-eight departments. Government officials as well as physicians and laity showed themselves alive to the urgency for action against the inroads of the disease, and co-operated heartily with the Commission in all its plans. The control program which was developed and put into operation in several newly organized units seems to meet the requirements admirably, and offers definite promise of supplying the need for a standardized working plan. During the year, also, the initial step was taken in the nationalization of the

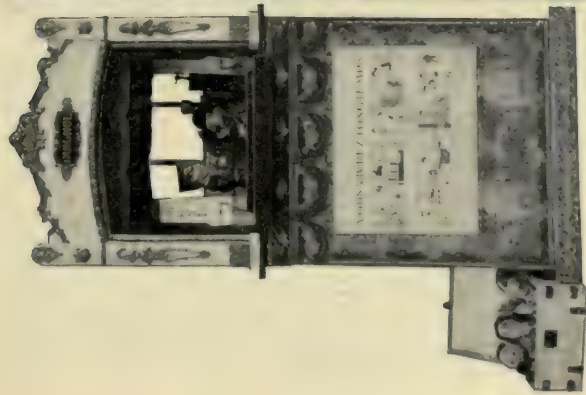


Fig. 12.—Eager admirers of the hygienic Punch-and-Judy. The exhibit appears at the left.
An important educational feature of the campaign against tuberculosis in France



Fig. 13.—Effect of hookworm disease on growth. Queensland, Australia. Left, boy of eighteen years, hookworm free; right, boy of nineteen, heavily infected with hookworms

tuberculosis campaign. This was when the Comité National—an organization created in 1915 for the aid of discharged tuberculous soldiers—assumed the title of the National Committee of Defense Against Tuberculosis. The new agency will extend its field of activity until it embraces the entire tuberculosis problem of the country.

Financial Participation of Government in Control Program

Another outstanding feature of the 1919 work was the enactment by Parliament of a law which provides that within five years every department of France must either construct a tuberculosis sanatorium of its own, or arrange to have the sanatoria of other departments receive its patients. The Central Government has bound itself to assist in the construction and maintenance of the sanatoria to the extent of 50 per cent of the cost. Furthermore, French general and municipal councils, in the various departments in which the Commission organized new tuberculosis dispensaries during the year, appropriated approximately \$713,000 for anti-tuberculosis work. In the department of Eure-et-Loir, where the initial rural dispensary work was undertaken, an agreement was reached between the authorities and the Commission whereby the department will take over all the

administrative expenses of its dispensaries in 1920. The Commission will provide only the salaries and transportation expenses of its physicians and nurses. These co-operative measures are an indication of the earnestness with which national and local authorities are facing the problem of tuberculosis control.

Progress in Control of Hookworm Disease

Work for the relief and control of hookworm disease was continued during 1919 in the twelve states of the United States and in the sixteen foreign states and countries here mentioned:

Southern United States

Alabama
Arkansas
Georgia
Kentucky
Louisiana
Maryland
Mississippi
North Carolina
South Carolina
Tennessee
Texas
Virginia

The East

Ceylon
China
Seychelles
Siam
Queensland (Australia)

West Indies

British Guiana
St. Lucia
Trinidad

Central America

Costa Rica
Guatemala
Nicaragua
Panama
Salvador

Brazil

Federal District
Rio de Janeiro
São Paulo

Eight new fields of hookworm operation were entered during the year. Infection surveys were completed or inaugurated in six of these

areas, and relief and control measures were begun in the two others. Surveys were undertaken and completed in the states of Minas Geraes and Paraná (Brazil); and other surveys were begun, but not completed by the end of the year, in the state of Maranhão (Brazil), in Porto Rico, and in Colombia, South America. An active campaign for the relief and control of hookworm disease was launched in Jamaica on May 1, and in West Virginia late in December. At the completion of the survey of Minas Geraes and Paraná in Brazil, these states entered upon a co-operative program of relief and control.

Invitations to Participate in Control Measures

An invitation to conduct an infection survey of the island of Santo Domingo, and to follow the survey, if deemed expedient, with measures of relief and control, was received from Admiral Snowden. This invitation had the approval of the Secretary of the Navy. Other invitations which reached the Board during the year, and which were accepted, were from the Health Officer and the Governor of Porto Rico, the invitation being forwarded through the Bureau of Insular Affairs, a branch of the War Department; and from the states of Bahia, Santa Catharina, and Espirito Santo (Brazil). The

initial step in each of these new fields will be an infection survey.

Outstanding Developments in Hookworm Control During 1919

During 1919 the outstanding features in the various fields of operation against hookworm disease were the rapid development in the installation of adequate latrine systems in advance of treatment campaigns, the increased financial participation of governments, and the evolution of anti-hookworm demonstrations into comprehensive public health agencies.

Failures of Previous Campaigns

The high re-infection rate in Ceylon brought out sharply the fact that unless soil pollution is stopped, treatment for hookworm disease brings only temporary relief. It is imperatively necessary not only that latrines be provided but that they be properly used. Porto Rico also affords a striking example of the hopelessness of treatment campaigns unless they are accompanied by good sanitation. More than \$347,000 has been spent in the hookworm relief measures which have been in progress in that island since 1902. A recent infection survey showed the infection to be as high as when the original program was begun. The indications are that more than 80 per cent of the rural popu-

lation remain infected. At more than three-fourths of the rural homes there were no latrines.

Value of Re-infection Surveys

Re-infection surveys were conducted during 1918 and 1919 in a number of previously treated areas in countries with which the Board has been in co-operation. The localities re-surveyed included, among others, areas in Ceylon, Costa Rica, Salvador, Nicaragua, British Guiana, St. Vincent, and Trinidad. All showed rates of re-infection corresponding inversely with the pro-

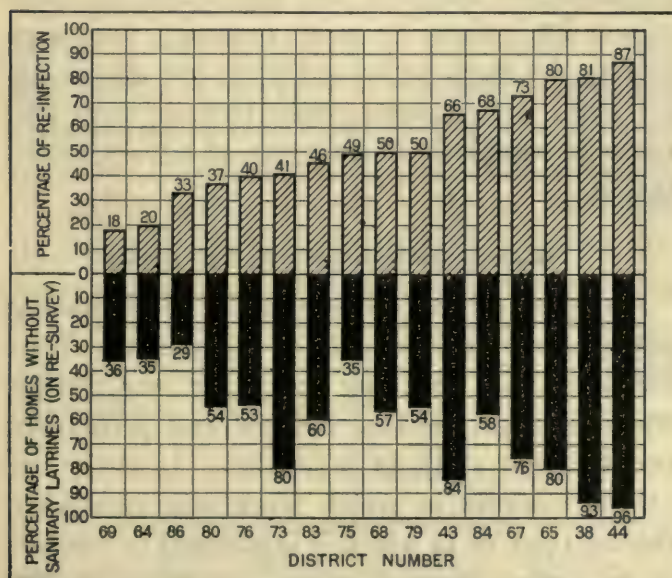


Fig. 14.—Relationship between (1) absence of sanitary latrines and (2) rates of hookworm re-infection. Sixteen districts in Trinidad

portion of rural homes provided with adequate and regularly used latrines. The results of the re-surveys were exhibited in graphic form and brought to the attention of the respective governments. At the same time the suggestion was made that, since it had proved futile to depend upon treatment alone as a permanent relief measure, work should be discontinued unless Government could sanitize all areas in advance of treatment, and keep them under a permanent system of sanitary supervision. The suggestion met with gratifying response. Many of the governments adopted the suggestion at once, others have done so more recently, and even among the most backward there are manifestations of a very earnest desire to inaugurate and carry to completion a program of advance sanitation.

Pre-campaign Sanitation in West Indies

Considered from the standpoint of permanent achievement, the results for 1919 in the West Indies surpass anything previously recorded for these colonies, because definite and permanent progress was made in sanitation. In every one of the colonies in which work was conducted during 1919, or in which it is planned to conduct work during 1920, Government is thoroughly sanitating each area of operation well in advance

of the inauguration of a treatment campaign. Latrines of a standard type, approved by the boards of health of the respective colonies, are being built, and permanent staffs of sanitary inspectors are being provided to enforce the sanitary regulations.

Advance Sanitation in Central America

In view of the fact that the Central American countries, with the possible exception of Costa Rica, have been slow in accomplishing definite results in sanitation, it is especially gratifying to report that they are now earnestly striving to secure proper sanitation of their areas at least six months in advance of treatment campaigns. The government of Panama has recently issued a decree making latrine construction obligatory throughout the republic, and the authorities in Salvador and Nicaragua have followed their earlier proclamations along this line, requiring the erection of latrines, with legislative provision for sanitary supervision to insure complete compliance with the laws.

Securing the Use of Latrines in Ceylon

The outstanding sanitary problem confronting the campaign workers in Ceylon remains that of securing the proper use of the latrines which have been erected on all the estates. The chief

difficulty lies in the fact that the Tamil coolies are strongly disinclined to use latrines, and often prove intractable. By insisting, in advance of the opening of treatment campaigns, that latrines shall be used and that the lines about laborers' quarters shall be maintained in sanitary condition, Government is placing on estate owners and superintendents the burden of securing proper compliance with its sanitary rules and regulations. There can be no doubt that this accomplishment marks a long stride forward. With proper support from the estate owners, it should not prove unduly difficult to accustom the mass of Ceylon laborers to the use of latrines, and to give them in addition at least a rudimentary education regarding other fundamental factors of sanitation.

Government Financial Participation in Hookworm Control

One index for gauging the measure of official and public recognition that is afforded the work, is the amount that governments grant toward its support. In this respect, too, the year 1919 showed steady progress. The governments of Guatemala, Nicaragua, Panama, and Salvador made their first appropriations toward the support of the program for hookworm control. In these countries the amount of the support

accorded was not large, but when their financial condition is recalled, and it is remembered that other pressing problems demand a large share of their resources, these pioneer appropriations assume added significance. Salvador and Nicaragua appropriated \$10,000 each for the year 1920, and the government of Panama, in its biennial budget for the period from July 1, 1919, to July 1, 1921, made an appropriation of \$5,000 yearly for the two-year period. Costa Rica, in spite of disturbed political conditions, is endeavoring to continue its co-operation, and has agreed to increase its budget for 1920 from \$6,400 to \$19,600. Guatemala, too, has made a beginning by appropriating the sum of \$1,200 toward the 1920 program.

Resumption of Work in Siam with Government Aid

The Siamese Government gave little financial support to the initial demonstration in hookworm control which was conducted in that country from February 7, 1917, to March 15, 1919. The work convinced the authorities of its value, however, and they requested its continuation. Therefore during 1919 a joint plan was adopted, providing for the extension of anti-hookworm measures and the undertaking of general public health activities throughout a wide rural area of the country. Operations

under the new program will be begun early in 1920.

Approximately \$17,000 yearly has been appropriated directly to the work by the Red Cross of Siam, which will be the local co-operating agency. In addition, this society will provide laboratory headquarters and free entrance of all medical supplies, and will secure the active

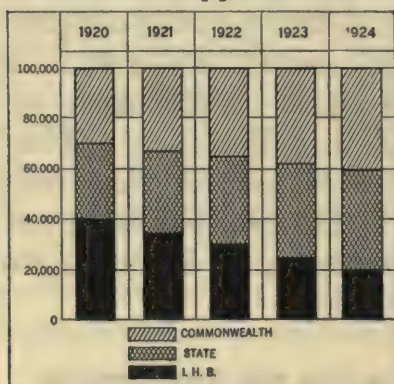


Fig. 15.—Sliding scale appropriations for health work in Australia. Five years beginning January, 1920

support of all local government officials in the enforcement of sanitary regulations. As its share of the expense of the first year's work, the Board will be called upon to appropriate approximately \$10,480, to

be used to pay the salaries of two directors and to buy drugs and scientific equipment.

Opening of Work in Queensland Under Enlarged Program

The inauguration of operations in Australia under the new plan, calling for greatly increased government and local support, was delayed until October 1, 1919. The delay was due to the necessity of securing and training a highly

qualified director to supervise the comprehensive health measures embraced within the proposed plan of procedure. The plans call for the annual expenditure, for five years, of \$100,000 from funds provided by the Federal and state governments and by the Board. The funds provided by the Board are to be contributed on a sliding scale for five years, at the end of which time the expense of the work will be borne entirely by Government (see Fig. 15, page 106).

Hookworm control measures are to form the central feature of the new plan, which is expected eventually to lead to the establishment of a modern, well-equipped Federal ministry of health. The initial steps will consist of hookworm control measures along the coast of Queensland, with surveys of the Northern Territory, Western Australia, and New South Wales. Later, control measures will be undertaken in the Australian South Pacific Islands, lately acquired from Germany, which include New Guinea and the Bismarck Archipelago.

Increased Government Support in Brazil

The graph and the maps, Figs. 16 and 17, exhibit the increase in territory covered and in local financial support received during the three years that have elapsed since the first infection survey and control demonstration were under-

taken in Brazil. The movement for increased local financial support, which began in 1917, continued and showed gratifying growth during 1919. The Federal Government made one appropriation of

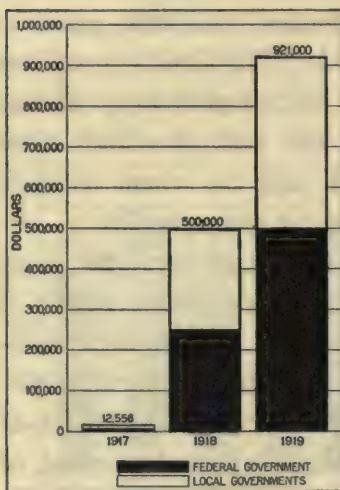


Fig. 16.—Increase in government and local support for anti-hookworm measures in Brazil. Comparison of funds appropriated for 1917, 1918, and 1919

\$500,000 for the partial support of campaigns which the states might institute for the control of rural endemic diseases, and another of \$500,000 toward the eradication of yellow fever from the country. In the course of the year, Federal and state governments together provided about \$921,000 for operations in rural sanitation, in which measures

against hookworm disease are to play a leading part. In all, ten states (including the Federal District) joined in a systematic attack on hookworm disease. Thirty-two posts were maintained in these states entirely at government expense.

Public Health Training in Brazil

The Laboratory of Hygiene which was established in connection with the Faculty of Medicine

and Surgery of the University of São Paulo, has been in operation since March, 1918. It offers a general course in various branches of hygiene and public health administration. Dr. Samuel T. Darling and Dr. Wilson G. Smillie, respectively, are the director and the assistant director of the new department. The work of the 1919 school year began in June. The course now being offered includes (in addition to classroom lectures) laboratory work in malaria and hookworm disease, disinfection, fumigation, and water and milk analysis; a study of various types of public health literature and publicity material; and practical field work giving opportunity for participation in anti-mosquito campaigns, in factory and sanitary inspections, in demographical surveys, and in operations for malaria and hookworm control. The staff of the school has also spent much time on practical field studies in the control of hookworm disease. It is expected that a part of the results of their researches will be published in current medical periodicals.

Organization of Department of School Hygiene

A division of school hygiene has lately been organized in connection with the department. The work of this division is to be conducted along the lines which are being followed with

success in the United States and in England. A Brazilian physician and a Brazilian nurse have been placed in charge of the work, and a school of about eight hundred pupils has been assigned as the initial field of demonstration. The new undertaking is believed to represent the first attempt that has been made in South America to utilize the school nurse to bring about that co-operation between parents, physicians, and teachers which is so essential for the utmost welfare of school children.

Fellowships as a Means of Promoting World-Wide Hygienic Progress

Perhaps no field of health work offers greater promise of definite and permanent usefulness than that of public health training. The goal of developing permanent and effective public health agencies in various countries lies in the direction of training competent native men to administer the public health programs. With the award of fellowships for graduate study, particularly to carefully selected medical men who reside in the countries where work is carried on, there is excellent prospect that men well trained in the more essential requirements of public health administration may return to their countries and achieve leadership in public health affairs.

Public Health Fellowships During 1919

Provision has been made for twenty-eight fellowships for study in the various branches of public health, and for seven to prepare teachers of hygiene and public health. It is hoped that the teachers will be available for possible service in schools of hygiene and public health in their native lands, as well as for chairs of public health in undergraduate medical schools. By the close of 1919 sixteen of the fellowships had been bestowed. Seven were granted to Brazilian and four to Czecho-Slovakian physicians; the remaining five went to medical graduates from Ceylon, Salvador, and the United States. In addition, provision has been made for bringing ten young French physicians to the United States for special study in preparation for service with the Board's Commission for the Prevention of Tuberculosis in France. No actual appointments under the latter grant, however, had been made up to the beginning of 1920.

Study Leave for Staff Members

Progress has also been made toward carrying out the plan whereby special health courses at leading American or foreign institutions may be pursued by members of the administrative or field staff. Up to the end of 1919 five regular

staff members had availed, or were availing, themselves of this study privilege: four at the School of Hygiene and Public Health at Baltimore, and the fifth at the London School of Tropical Medicine. Six other physicians, all of them under appointment to the field staff, were pursuing an intensive course of training at the Baltimore school. This preliminary training includes brief courses in medical entomology, parasitology, and protozoölogy, which it is hoped will enable them to discharge the more promptly and acceptably the duties involved in field positions. After it becomes possible to choose new staff members among graduates of public health schools, elementary training of this kind will be unnecessary.

Organization of Public Health Laboratory Service

A public health laboratory, like a department of vital statistics, is essential to any effective system of public health administration. If a health service is to act intelligently, facilities must be at hand for making prompt and accurate diagnoses. These involve the examination of specimens of blood, feces, and urine; the analysis of water, food, and milk supplies; and many other bacteriological, chemical, or sanitary operations. The numerous requests which have been received for counsel in organizing or

improving the laboratory service of various national, state, and municipal health departments led to the engagement of Col. Frederick F. Russell, of the United States Army Medical Service, to undertake the organization of a division of laboratory service under the auspices of the Board. His first duty was to assist the Alabama State Board of Health in re-organizing and further developing its laboratory facilities.

Study of Laboratory Needs in Utica

It has been suggested at various times that efficiency and economy might perhaps be promoted in some communities by having a central laboratory which could furnish the diagnostic work required by the health service, as well as meet the needs of the government and private hospitals. Pooling of the resources should make it possible to employ a more highly skilled staff, permit research work, and at the same time reduce the unit cost. In September, 1919, Dr. J. H. Waite, a member of the Board's staff, made an inquiry into the possibilities in this respect at Utica, New York. Reports and recommendations based on the findings have been submitted, and are now being considered by the New York State Board of Health. The survey of Dr. Waite was largely provisional, and marked an attempt to learn whether similar

studies offered promise of useful development in this direction.

The Board as a Clearing-House for Public Health Information

During the year 1919 the first steps were taken looking toward a comprehensive study of public health administration. Preliminary studies were made, dealing with the public health work done by the Children's Bureau, by the Bureau of the Census, and by the Bureau of Education, of the Federal Government; a general study of public health administration in Massachusetts was undertaken with the assistance of the State Department of Health; a collection was made of the public health bills which have been presented to Congress, and of the reports of committee hearings and legislative debates on these bills; information on the organization of state, county, city, and town health administration, and on the relationship between state and local health authorities, was gathered from the laws and regulations of the various states; data on expenditures for public health purposes by states, cities, and countries were brought together; a special report on hospitals and dispensaries was prepared and published; and a report on infant welfare work in New York City was revised. As a background for the study of public health

administration, a current working bibliography for office use was compiled.

Study of Facilities for Medical and Public Health Training

Dr. R. M. Pearce, director of the Division of Medical Education of the Rockefeller Foundation, visited Chile and Paraguay and made a study of medical education. His investigations were undertaken as part of the plans calling for an intensive study of the status of medical and public health training in countries throughout the world. The Board's Department of Surveys and Exhibits compiled memoranda containing information of interest in the field of public health, and distributed them gratuitously to educational institutions, government authorities, commercial bodies, and private institutions. The same department also continued the survey that it had begun in 1918 for the purpose of bringing together information on the educational facilities employed by various countries in the teaching of hygiene and public health. Reports dealing with the subject were prepared for England, France, Holland, Switzerland, Italy, Spain, and Germany.

Issuance of Handbook on Methods for Hookworm Control

A special handbook outlining in detail the field methods employed by the Board in the control

of hookworm disease, was published during the year. The booklet was written by Dr. H. H. Howard, Regional Director for the West Indies, and was entitled: "The Control of Hookworm Disease by the Intensive Method." The treatise contains data of practical value to physicians, nurses, and laboratory personnel. It should also prove useful as a means of interesting governments and of stimulating them to undertake anti-hookworm operations, either independently or in conjunction with the Board.

Publications

The following is a complete list of the reports and publications issued by the International Health Board during the year 1919.

PRINTED REPORTS (*for general distribution*)

Annual Report for the Year 1918.

Control of Hookworm Disease by the Intensive Method. By Dr. H. H. Howard, Director for the West Indies.

LITHOGRAPHED REPORTS (*for limited distribution*)

Annual Reports for 1918 on Work for the Relief and Control of Hookworm Disease in the following countries:

West Indies

British Guiana
St. Lucia
St. Vincent
Trinidad

Dr. F. W. Dershimer
Dr. Stanley Branch
Dr. P. B. Gardner
Dr. G. C. Payne

Central America

Costa Rica
Nicaragua
Panama
Salvador

Dr. Louis Schapiro
Dr. D. M. Molloy
Dr. W. T. Burres
Dr. C. A. Bailey

South America

Brazil

Dr. L. W. Hackett

The East

Fiji

Dr. G. P. Paul

Queensland

Dr. J. H. Waite

Seychelles

Dr. J. F. Kendrick

Siam

Dr. M. E. Barnes

Reports on Hookworm Infection Surveys in the following countries:

State of São Paulo, Brazil

Dr. J. L. Hydrick

Jamaica

Dr. M. E. Connor

The Illustrated Story of Hookworm Disease.

Report on Microscopic Re-examination of Patients Cured Prior to June 1, 1918, in Work for the Relief and Control of Hookworm Disease in Trinidad—Dr. Geo. C. Payne.

Report on Work for the Relief and Control of Soil-Pollution Diseases in Texas from April 15, 1916, to December 31, 1918—Dr. P. W. Covington.

Report on Rural Sanitary Work in Seven Mississippi Counties from October 20, 1916, to July 1, 1919—Dr. W. S. Leathers and Dr. Chaillos Cross.

Report on Rural Sanitary Work in Harrison County, Mississippi, from January 18 to December 31, 1918—Dr. P. G. Pope.

Articles and Reprints

Other important contributions to medical and public health literature were made during the year. Most of these were in the form of articles published in medical journals that are widely circulated among persons interested in medical and public health topics. A list of these articles follows:

DR. M. E. BARNES. Report for the third quarter, July–September, 1918, on work for the eradication and control of uncinariasis in Siam. *China Medical Journal*, Jan., 1919, v. 33, p. 74–75.

DR. C. C. BASS. Studies in malaria control:

No. 1. Relative frequency of malaria in different ages and age groups in a large area of great prevalence. *Southern Medical Journal*, Aug., 1919, v. 12, p. 456–460.

No. 2. Treatment of malaria with the special object of disinfecting infected persons. *Journal of the American Medical Association*, Apr. 26, 1919, v. 72, p. 1218–1219.

No. 3. Observations on the prevalence of malaria and its control by treating malaria carriers in a locality of great prevalence in the Mississippi delta. *Southern Medical Journal*, Apr., 1919, v. 12, p. 190–193.

No. 4. Frequency of malaria relapse in an area of great prevalence in the Mississippi delta. *Contributions to Medical and Biological Research*, dedicated to Sir William Osler, etc., 1919, p. 323–326.

No. 5. Importance of disinfecting all cases treated as a factor in malaria control in a locality of great prevalence. *Southern Medical Journal*, June, 1919, v. 12, p. 306–310.

No. 6. Frequency of malaria infection without recognized symptoms compared with recognized attacks in an area of great prevalence. *Southern Medical Journal*, Aug., 1919, v. 12, p. 460–462.

No. 7. Proportionate dose of quinine required to obtain same results in treating malaria in children of different ages as in adults. *Southern Medical Journal*, Aug., 1919, v. 12, p. 462–465.

No. 8. Some observations indicating that effective immunity against malaria parasite infection does not occur. *Southern Medical Journal*, Aug., 1919, v. 12, p. 465–467.

No. 9. Effective and practical treatment of malaria to disinfect infected persons and to prevent relapse. *Journal of the American Medical Association*, July 5, 1919, v. 73, p. 21–23.

Some phases of tropical medicine in the recent world conflict. *New Orleans Medical and Surgical Journal*, Aug., 1919, v. 72, p. 72–81.

DR. M. E. CONNOR. Questionario sobre fiebre amarillo. Guayaquil, Imp. municipal, 1919, 10 p.

Conferencia celebrada ante el profesorado de las escuelas de la ciudad de Guayaquil, Guayaquil, 1918, 5 p.

DR. S. T. DARLING. Pesquisas recentes sobre a opilação na Indoneisia. *Annaes paulistas de medicina e cirurgia*, Feb., 1919, v. 7, p. 25-38. Same reprinted in *Faculdade de medicina e cirurgia de São Paulo, Instituto de hygiene, Boletim N. 2*.

Sobre algumas medidas anti-malaricas em Malaya. *Faculdade de medicina e cirurgia de São Paulo, Instituto de hygiene, Boletim N. 1*.

DR. F. W. DERSHIMER. The uncinariasis campaign. *British Guiana Medical Annual*, 1919, v. 22, p. 29-32.

DR. LIVINGSTON FARRAND. Future co-operation between the American Red Cross and public health agencies. *American Journal of Public Health*, Aug., 1919, v. 9, p. 583-585.

DR. S. M. GUNN. Une guerre nécessaire contre la tuberculose. *Je sais tout*, May 15, 1919, v. 15, p. 529-537. Same reprinted. English trans. in *American Journal of Public Health*, Oct., 1919, v. 9, p. 767-775.

DR. V. G. HEISER. Teaching public health by demonstration, New York State department of health. *Health News*, Sept. 1919, v. 14, p. 226-229. Same reprinted.

DR. A. I. KENDALL. National and international relations of sanitation in Ecuador. *Journal of the American Medical Association*, Feb. 22, 1919, v. 72, p. 599-600.

DR. MARIO LEBREDO. Consideraciones que sugiere lo publicado por el Dr. Noguchi sobre etiologia de la fiebre amarilla. *Vida Nueva*, July, 1919, v. 11, p. 145-155.

DR. E. C. MEYER. Hospital service in rural communities. *Journal of the American Medical Association*, April 19, 26, May 3, 10, 17, 1919, v. 72, p. 1135-1136, 1219-1223, 1365-1367, 1460-1463. Same reprinted.

DR. J. A. MILLER. Tuberculosis among European nations at war. *American Review of Tuberculosis*, Aug., 1919, v. 3, p. 337-358.

DR. WICKLIFFE ROSE. Field experiments in malaria control. *Journal of the American Medical Association*, 1919, v. 73, p. 1414-1420 (abbreviated article, maps omitted). Same reprinted, with maps, 28 p. Spanish trans. in *Journal of the American Medical Association* (Spanish edition), Nov. 15, 1919 v. 2, p. 660-667. Same reprinted.

- DR. LOUIS SCHAPIRO. Physical and economic benefits of treatment for hookworm disease. *Journal of the American Medical Association*, Nov. 15, 1919, v. 73, p. 1507-1509. Same reprinted. Spanish trans. in *Journal of the American Medical Association* (Spanish edition), Dec. 15, 1919, v. 2, p. 793-795.
- DR. H. A. TAYLOR. Malaria control demonstration at Hamburg, Arkansas. *Southern Medical Journal*, Feb., 1919, v. 12, p. 74-86. Same reprinted.
- DR. J. H. WAITE and DR. I. L. NEILSON. Study of the effects of hookworm infection upon the mental development of North Queensland school children. *Medical Journal of Australia*, Jan. 4, 1919, v. 1, p. 1-10. Same (without tables) in *Journal of the American Medical Association*, Dec. 20, 1919, v. 73, p. 1877-1879. Same reprinted.
- DR. LINSLEY R. WILLIAMS. Public health work in Germany in the area occupied by the American army, New York state department of health. *Health News*, Oct., 1919, v. 14, p. 249-252.

In addition, Dr. Noguchi, a member of the staff of the Rockefeller Institute for Medical Research, whose services had been lent to the International Health Board for special studies, contributed papers to the *Journal of the American Medical Association* and to the *Journal of Experimental Medicine*. The articles set forth the chief features and the results of his investigations at Guayaquil, Ecuador, regarding the etiology of yellow fever.

Other Publications and Exhibits

An exhaustive bibliography on hookworm disease, intended to cover all available references in medical literature on this subject, is now nearing completion and will be ready for publica-

tion at an early date. Further progress has been made, also, on the production of a film on hook-worm disease and in connection with a lecture chart on malaria.

Lending Staff Members for Special Service

The Board is frequently called upon to lend its staff members to health agencies for special assignments of research and investigation, or to advise health officers on definite aspects of their work. Special service of this kind constitutes one of the fields in which the Board may be helpful, and in which it may do much to realize its fundamental aim: that of aiding in organizing or further developing health services of various kinds.

Survey of Health Conditions at Halifax

The survey of health conditions at Halifax, which was undertaken by Dr. Heiser soon after the holocaust there, is a case in point. The study led to definite recommendations for the creation of a modern municipal health organization. The recommendations were accepted and were embodied in the new health program adopted for the city. The Board was invited to keep in close touch with the plans, and its co-operation and advice at every step of the way have been welcomed.

Publication of Railway Sanitary Code for United States

The Board donated, also, the services of one of its staff members to assist in the preparation of a railway sanitary code for the United States Railroad Administration. This effort marks the first attempt to compile a uniform code of such a nature for the railroads of the country. It promises to have a far-reaching and salutary effect as a means of giving a practical education in hygiene to the 2,000,000 railroad employes and to the many millions of railroad patrons.

Other Incidental Activities of Staff Members

Dr. Waite made a survey of health conditions in Olean, N. Y., and furnished a report to the New York State Department of Health. Among other activities for which staff members were lent during the year were the completion of the special social hygiene survey which was undertaken in 1918 for the American Society of Social Hygiene, and the supplying of staff members to conduct a nursing survey for the American Red Cross. These and the many other less important and incidental services of this kind which were rendered during the course of the year, represent in their aggregate an important contribution toward the promotion of "the well-being of mankind throughout the world."

Additional Information in the Appendix

The annual report of the International Health Board for the year 1918 contained, in the form of an appendix, a detailed account of the problems encountered by the Board throughout the course of its various field operations for the control of hookworm disease, and a discussion of the working methods employed in meeting these problems. Health workers throughout the world seemed to find this text of value as a working handbook. Requests for copies of the report exceeded the available supply. In order that the numerous demands for this material might be met, the Board has included in its report for the current year a reprint of the hookworm section of the report for 1918, revised to include the results of the research and the practical work of 1919. In the following pages therefore will be found a complete discussion of the Board's experience up to the end of 1919 in measures for the control of hookworm disease.

The sections of the appendix relating to the control of yellow fever, the studies and demonstrations in malaria control, and the campaign against tuberculosis in France deal primarily with the results for the year 1919.

APPENDIX

I

EXTENT AND SEVERITY OF HOOKWORM DISEASE

Hookworm infection is found in all tropical and sub-tropical countries in the zone which encircles the earth between parallels 36° north and 30° south. An idea of the wide-spread prevalence of the disease within this infected zone may be gained from the following statements. In fifteen foreign countries, measures for the relief and control of hookworm disease were terminated during 1919 in eighty-three rural areas having an average population of 4,322. In fifty-eight of these areas more than sixty of every one hundred persons examined were found to be infected. In fourteen of the areas the infection rate was between 90 and 100 per cent; in sixteen between 80 and 90 per cent; in fifteen between 70 and 80 per cent; and in twelve between 60 and 70 per cent. In only three areas were rates lower than 20 per cent recorded.

High Rate of Infection in India. Microscopic examination in Ceylon of more than 50,000 Tamil coolies from Southern India has shown more than 98 per cent of them

to be infected. This confirms the investigations carried out by the Indian Medical Service at Negapatam, the great clearing port for labor leaving South India, which showed 99.8 per cent of the emigrant laborers to be infected. Much of India's population of 300,000,000 is under the burden of a heavy hookworm infection and is the source from which the disease is carried to many parts of the world. In some of the rural regions of that country, from 80 to 100 per cent of the population is infected.

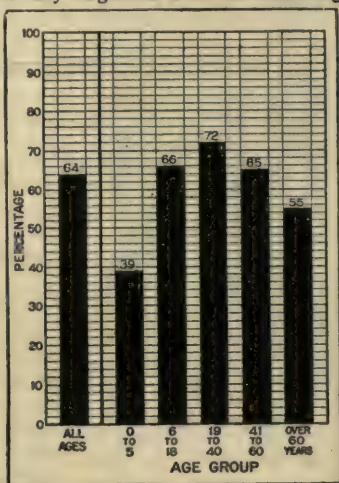


Fig. 18.—Rates of hookworm infection by age—all countries. Based on examinations from March 12, 1914, to December 31, 1919

The original investigation carried out by Lieut.-Col. Clayton Lane under the auspices of the Indian Research Fund Association, in a group of tea gardens in Assam, showed 63 per cent of the 33,590 persons examined to be infected; and a second inquiry carried out by the same investigator, in the jails of Bengal presidency, demonstrated the infection in 8,973, or 71.3 per cent, of the 12,570 prisoners examined. In all, twenty-six jails were visited, and the rates of infection recorded ranged from 47.9 in the Presidency jail at Calcutta to as high as 86 per cent in the jail at Hooghly. The sanitary authorities believe that more than 30,000,000 of the 45,000,000 inhabitants of Bengal proper are infected, and are undertaking a systematic attack on the disease, beginning with a campaign in the schools.

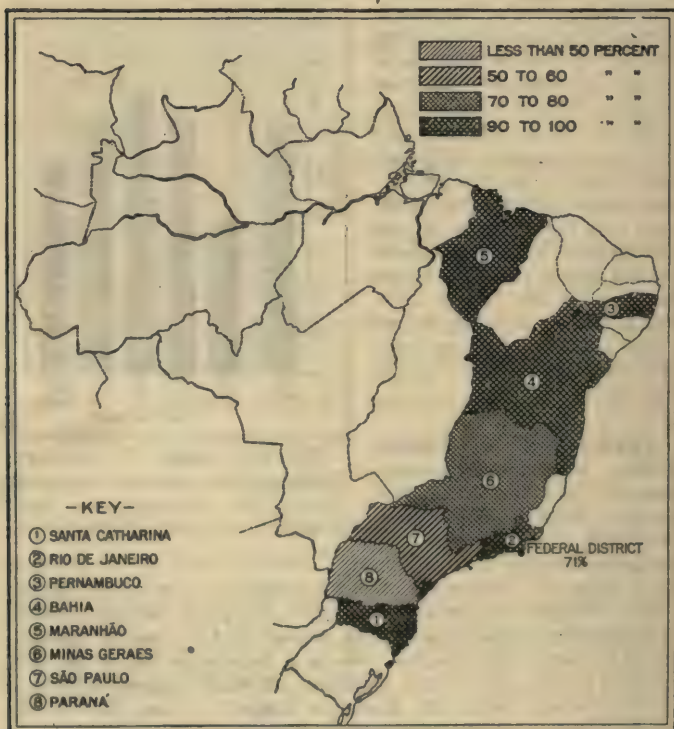


Fig. 19.—Rates of hookworm infection in Brazil, by states. Based on surveys and control measures up to December 31, 1919

Prevalence of the Disease in Brazil. In Brazil the field of operations against hookworm disease is almost unlimited. As far south as the state of Rio de Janeiro the average infection has reached 85 per cent, and the recent survey of the state of Maranhão shows that in no town yet examined in that state is the incidence of the infection less than 96 per cent. Considering all the areas of Brazil in which anti-hookworm work was completed during 1919, not less than 86.8 per cent of all persons examined were found to be infected with one or more kinds of intestinal parasites, hookworm infection alone being present in two of every three persons examined.

The Director of Rural Sanitation estimates that more than 80 per cent of the adults and more than 90 per cent of the children living in rural portions of the Federal District of Brazil are infected with some form of intestinal parasite. The number infected with hookworm he puts at 100,000, or two-thirds of the district's rural population. Among the first 1,839 persons examined in Jacarepagua, a typical rural community of this District, the percentage found infected with hookworm was 75, and only six persons were found who were free of all forms of intestinal parasites.

In the survey of the state of São Paulo three of every five persons examined were found to be infected with hookworm disease and four of every five with some type of parasite. On coffee plantations in the latter state practically 100 per cent of the adult population, or persons fourteen years of age or over, are infected, and the average number of hookworms harbored per person is as high as 160. Among the first 450 persons examined in the state of Paraná every one was found to be infected with hookworm. The infection on the plateau of this state, except in one or two cities, is low, but its littoral, though well within the temperate zone, shows an incidence of infection among the highest in Brazil. Similarly, the preliminary observations in the recently inaugurated survey of the state of Santa Catharina show a very high incidence of infection along the coast, ranging in seven towns from 77 to 98 per cent.

Infection Rates in Sumatra and Formosa. In Sumatra the infection is found probably as frequently as anywhere else on the globe. Van der Heijden and Schueffner examined, during 1914,

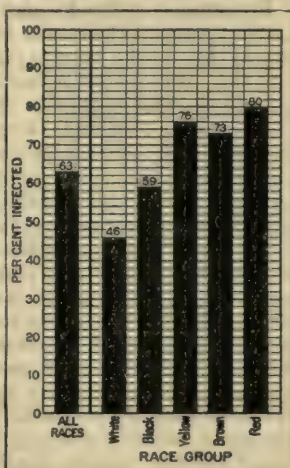


Fig. 20.—Rates of hookworm infection by race—all countries. Based on examinations from March 12, 1914, to December 31, 1919

thousands of laborers in the Lampong district of South Sumatra and reported that not a single one was without hookworm infection.

In Formosa, recently, among a group of political prisoners in the Taikoku jail, practically all of whom had come from the mountain villages of that country, 90.3 per cent infection was found among the first 300 prisoners examined. This led to the examination of 1,000 other prisoners, 97 of whom were Japanese and the other 903 Formosans. The inquiry developed that 59.0 per cent of the Formosans and 36.1 per cent of the Japanese were harboring hookworms.

Prevalence of Hookworm Infection in Central America. In Central America the results of approximately five years' work have shown that on the average two of every three rural inhabitants are infected. Within the borders of most of the countries, however, there are wide regional or climatic differences in the rates of infection, as in Guatemala, for example, where the infection rate on the Atlantic slope is only 37 per cent, as compared with 88 per cent on the Pacific. Operations in this country during 1919 were confined almost entirely to regions near the Pacific, and on the average eighty-six of every one hundred persons examined were found to be infected.

In Colombia, which adjoins the Central American countries on the south, there is an average infection rate of 78.1 per cent, ranging by provinces from the lowest (9.6) in Bogotá to the highest (98.7) in Ubaté. For all districts having an altitude of less than 6,600 feet, the average infection rate is not less than 81.4 per cent. There are numbers of smaller areas in Central America where the infection approaches 100 per cent, as, to choose but one or two examples from the 1919 control operations, the district of Santiago, province of Veraguas, Panama, where 97 per cent of the people examined were found infected; and the districts of General and Osa in Costa Rica, where 94.9 per cent were found to be infected with hookworm and 100 per cent with one or another type of intestinal parasite.

Infection Rates in Countries Recently Inaugurating Control Measures. An infection rate of 60.5 per cent was recorded among 12,504 surface and underground workers examined in a control campaign carried out at the Pinghsiang colliery in China; of 33.4 per cent among 777 persons examined at the Tayeh Mines and Works in the same country; of 78 per cent among 37,971 persons examined in the province of Chiangmai, Siam; of 21.1 per cent among 21,844 persons examined in twelve small settlements in the state of Queensland, Australia; and of 52.3 per cent among 6,413 persons examined in the first two areas worked in the island of Jamaica. These are countries in which co-operative control measures have been inaugurated during the past three years. Reports from Australia had indicated that there was little or no infection among the aborigines, but over 80 per cent of all those examined to date have

been found infected. Arrangements for their treatment are now being made through the Chief Protector of Aborigines.

Factors Favoring or Retarding Infection. The influence of vegetation, shade, and the character and cultivation of the soil was strikingly shown in the state of Minas Geraes, Brazil, during 1919. This state is divided into two great regions: prairie and woods; the one is grassy and rolling, with little or no shade and with sandy soil; the other is fertile, with a clay subsoil and abundant lime matter. In the first region cattle are raised; the second was formerly a forest. In the sandy region only sixty-six of every one hundred persons examined were found to harbor hookworm disease; in the wooded

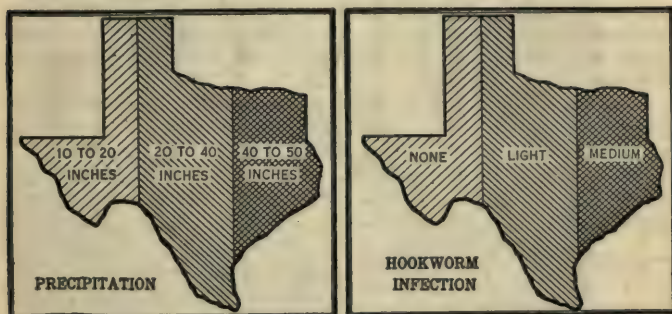


Fig. 21.—Correlation between rates of hookworm infection and amount of rainfall. Texas

region, there were ninety persons infected of every hundred examined. The town of Guinda, with 24.2 per cent, showed the lowest percentage of hookworm infection: it was situated in the midst of a region which possessed a dry and sandy soil, without vegetation, without shade, and with no cultivation.

Effect of Rainfall in Promoting, and of Salt in Retarding, Development of Larvae. Rainfall is an important contributing factor in the spread of the disease. In six adjoining settlements of Queensland, Australia, in which work was conducted during 1918, the percentage of hookworm infection ran parallel with the amount of rainfall. Thus, in two districts having an annual rainfall of less than 90 inches, the percentage of infection was 13.8, while that in four districts having more than 90 inches of rainfall was 27.8. Salt, on the other hand, plays an important part in retarding development of the larvae and in preventing the spread of the infection. In regions near the coast, upon which the sea frequently encroaches and the soil is impregnated with salt, the infection is always light. In Jamaica

during 1919, for example, the infection in a single district of twenty-eight square miles varied widely from the rates of 70 to 80 per cent recorded among East Indian laborers living in estate barracks, to those of 20 to 25 per cent established by examining the residents of low-lying and swampy sea-coast villages, where the sanitary conditions were no better than in the higher regions.

Infection in Relation to Altitude and Climate. The most favorable temperature for the development of the larvae is from 25° to 35° Centigrade (77°–95° F.). Below 22° Centigrade (72° F.) few larvae develop. In the republic of Colombia, for instance—a country where sharp distinctions in climate follow the sharply differentiated zones of altitude—a survey just completed showed that in the zones of altitude where the climate was tropical or sub-tropical the average infection rate was 84.1 per cent, as compared with only 9.6 per cent in the temperate zone. In the cold regions there was no infection whatever.

In the state of Paraná, Brazil, there is heavy infection among the people of the coast towns, with very light infection on the plateau; and in Australia, similarly, a surveying trip to Chartres Towers, a famous gold mining center located at an altitude of 1,000 feet, disclosed a rate of only 3.0 per cent among the 1,817 children and 123 adults examined, as compared with a rate of 18 per cent among adults

and children living in the coastal plain of the same state. The history of the infected persons showed that more than three-fifths of them were native to the coastal area or had passed several vacations there. In Ceylon, too, as the staff workers move toward the higher central watershed, the rate of infection becomes lower and lower and clinical evidence of the disease almost disappears.

Hookworm Primarily a Rural Disease. Persons who live in the country, away from sewerage, and who work in the soil, are much more frequently infected with the disease than city residents. The urban districts of Porto Rico, for example, showed, in a recent survey, a rate of only 21 per cent infection, despite the fact that for the island as a whole the average

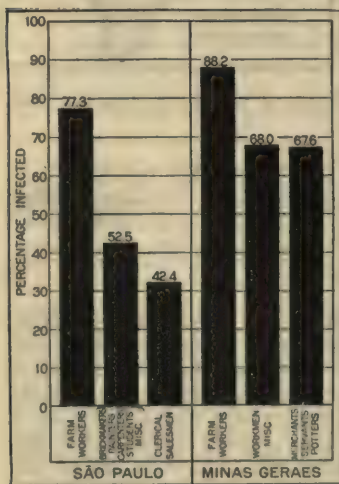


Fig. 22.—Rates of hookworm infection by occupation. States of São Paulo and Minas Geraes, Brazil



Fig. 23.—Family of sixteen, each member infected with hookworm disease.
Marion county, Mississippi



Fig. 24.—Group of Australian aborigines assembled for hookworm treatment. These indigenous people had been thought to be practically free of infection but examinations to date disclose an infection rate of 81 per cent

rate is 82.6 per cent. In sugar and tobacco producing districts the infection rate was 85.5 per cent; and in coffee raising districts, where denser shade exists and conditions are more favorable for the development of larvae, it was 97.7 per cent.

Infection Rates by Occupations, in Colombia and Brazil.

Figure 22, page 130, compares the rates of infection found among various types of workers in the states of São Paulo and Minas Geraes, Brazil. It indicates the contrast that exists between workers who are thrown much in contact with the soil and those whose work is either indoors or in urban districts. This distinction is further borne out by survey findings for the state of Matto Grosso, Brazil, where hookworm infection certainly exists and is wide-spread, though the nomadic horseback life of the cattle rangers who comprise the bulk of the state's population has prevented the disease from assuming serious importance economically or clinically.

The data collected with respect to occupations in Colombia coincide with those for other countries. As usual, the agricultural industries as a whole (including cattle raising, and the growing of coffee, sugar, and vegetables) gave the highest rate of infection, with coffee laborers showing the greatest prevalence (93.9 per cent) of any of the agricultural groups examined. The miners of Colombia, on the other hand, showed only 17.1 per cent infection—a surprisingly low rate of infection for miners—though the latter rate may doubtless be accounted for in part by the fact that the mines are located in temperate regions.

Relationship Between the Wearing of Shoes and the Rate of Infection. Persons who go barefooted, or those who in other ways allow the bare skin to come into contact with polluted soil, show correspondingly higher rates of infection than those who wear shoes. For example, the survey of the state of São Paulo, Brazil, concluded during 1918, showed only 41.2 per cent infection among shoe wearers, as compared with a rate of 62.9 per cent among persons who went barefooted. In Colombia, too, the infection survey showed an incidence of only 38.8 per cent among those who habitually wore shoes, as compared with 81.5 per cent among those who went barefooted. Everywhere the findings speak volumes in favor of the use of shoes, but in most regions the economic conditions preclude their widespread adoption.

SEVERITY OF THE INFECTION

The severity of the disease is now believed by many authors to depend primarily upon the number of worms harbored by infected individuals. Generally, the higher the percentage of persons infected in a given locality, the larger is the average number of worms harbored by infected individuals, the more severe are the symptoms found, and the more difficult is the disease to bring under control.

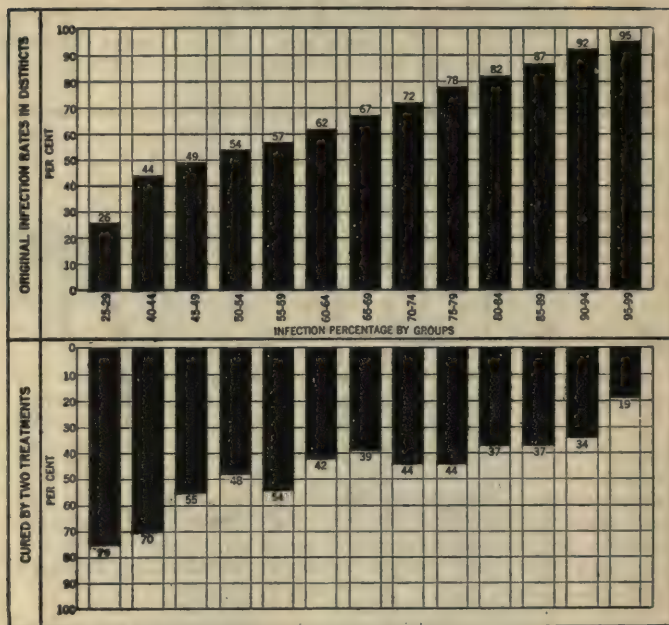


Fig. 25.—Difficulty of curing hookworm disease where infection rate is high. Relationship between rates of hookworm infection and cures by two treatments. One hundred fifty districts in Trinidad. Persons examined, 42,284

The difficulty of effecting cures in localities with high rates of infection is strikingly illustrated by figures compiled in Brazil and in Trinidad. In the former country, the percentage of persons cured by two treatments of the same drug, administered in the same manner, and under practically the same conditions, was 38 in Rio Bonito, a municipality having an infection rate of 88.5 per cent, and 71 in Guarulhos, where the infection was 57 per cent.

The statistics for Trinidad (Fig. 25) cover the examination of 42,284 residents of that colony during the period from May 15, 1915, to December 31, 1918. It will be noted that in districts with 25 to 29 per cent of their inhabitants infected, the percentage of infected persons cured by two treatments was as high as 75. As the rate of infection rose, the difficulty of curing increased, until in localities with extremely high rates of infection—representing between 95 and 99 per cent of their inhabitants—only 19 per cent of the infected persons could be cured by two treatments. The drugs

used and the conditions of administration were practically the same in all districts.

Determining Severity by Counting the Worms. The number of worms harbored by a group of individuals may be ascertained quite accurately by giving the persons a vermifuge and counting the worms expelled after the drug has acted. It is usual to count the worms for a period of two or three days following each treatment. Worm counts are of value not only because they reveal the average degree of infection in different communities, as well as the type of worm harbored, but also because they are of much assistance as a means of demonstrating the presence of the disease and enlisting popular support in measures for its control.

Infection Index in Different Regions.

In Siam the feces of fifty-nine persons were examined for seven hours after first treatment. The average number of worms expelled was forty-five. More than half (thirty-nine) of the cases harbored less than twenty worms each. In Formosa, on the other hand, 11,663 worms were obtained from ninety-three persons who were given trial treatment. This is an average of 125 per person. The greatest number of worms obtained post-mortem was 1,139. In Nicaragua as many as 4,000 worms were recovered from a single patient, and in Brazil particularly high worm counts have been obtained in the states of

São Paulo and Rio de Janeiro. In these states the incidence of the infection is reported to be high and the disease severe in form, despite the fact that the climate is cool the year round. The total of 29,029 hookworms recovered from 280 residents of these states, who were treated to determine the degree of infection, gave an infection index¹ of 104. This is twelve points higher than the index for Java, where the disease was thought to be more wide-spread and more severe than in Brazil (Fig. 26).

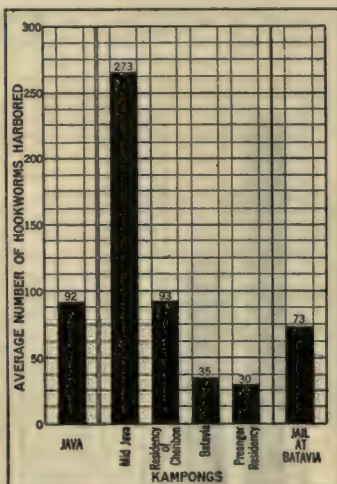


Fig. 26.—Hookworms harbored by three-hundred seventy-eight infected persons in Java. Distribution by localities

¹ Average number of worms per case.

Worms Harbored by Brazilian Vagabond Boys. Nearly 11,000 worms were recovered from a group of eighty-one vagabond boys treated in the state of Rio de Janeiro. The counts ranged from two to 982; the average was 133. Another boy, who was too weak to receive the three treatments which were administered to the first eighty-one, expelled 1,912 worms as a result of the two treatments he was able to take. In a similar experiment among forty-five vagabond boys in the state of São Paulo, an average of 233 worms was obtained after treatment from nineteen boys who had always lived in the country, and an average of fifty-nine from twenty-six boys who had always been city residents.

Degree of Infection Among Agricultural Workers in Brazil. Townspeople are always more lightly infected than agriculturists.

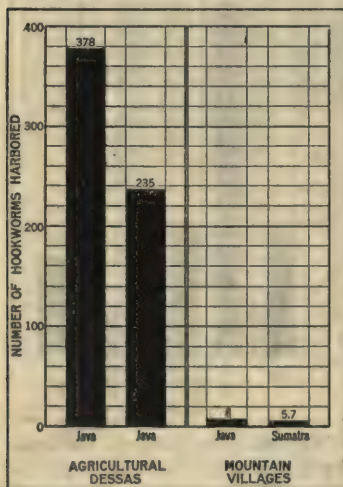


Fig. 27.—Comparison of number of worms harbored by agricultural workers and dwellers in mountain villages. Java and Sumatra

This is shown, for example, in Figure 26, page 135, which compares the infection indices of town residents, mountaineers, and agricultural workers in Java. The urban dwellers treated in Brazil yielded, on the average, less than fifty worms, while groups of farm laborers expelled from fifty-five to 233. From three adult farm workers in Guarulhos, 1,390, 1,031, and 405 worms apiece, or 972 average, was obtained. The average number of worms harbored by all workers on coffee plantations in the states of Rio de Janeiro and São Paulo doubtless reaches 160 or more; children under fourteen years of age living on these farms have been found to harbor as many as 365 worms. Coffee growers, and employers of agricultural labor in general, realize what this means as a cause of debilitation and inefficiency,

and are becoming interested in efforts to promote the health and working capacity of their laborers through treatment for hookworm disease and the prevention of soil pollution.

Severity of Infection Among Southern Troops in U. S. Army. Knowlton, in his work at Camp Jackson, South Carolina,

treated for hookworm disease a large number of infected soldiers from the Carolinas and Florida. Among sixty-nine white and eighteen colored cases, the average number of worms obtained from the whites was 155.3; from the colored, 38.3. In a considerable proportion of the soldiers the infection was mild in form, but all grades were encountered, and in a few cases the infection was severe; three white patients yielded 1,010, 1,263, and 1,704 worms, respectively.

Through the means of the laboratory car *Melchnikoff* there were unsurpassed facilities for observing the effects of hookworm disease upon troops of the Southern Department of the United States Army, including recruits from the states of Texas, Oklahoma, Arizona, and New Mexico. Marked clinical symptoms were absent in 90 per cent of the men who, upon microscopic examination, were found to be infected; on treatment the number of worms expelled the first day by 80 per cent of the infected soldiers ranged only from one to five. This is an unusually light infection. The men dealt with, however, were between twenty and thirty years of age, an age period in which individual infections are dying out, and only a small proportion came from regions of heavy infection.

Correlation Between Number of Worms and Percentage of Hemoglobin. In general, there is definite relationship between the number of hookworms harbored and the amount of blood loss or anemia. This may perhaps be obscured by the resistance of the infected person, by abundant food, opportunities for rest, or by exceptionally active blood-forming processes, but the drain is none the less real and a constant tax on the vital powers. Thus, in the state of São Paulo, Brazil, during 1918, the average hemoglobin of six boys above fourteen years of age who harbored more than 400 worms each, was 63.7 per cent, as compared with an average of 72.7 per cent among forty-six boys of the same age who harbored less than seventy-five worms each. The normal hemoglobin of boys of this age is 84 per cent. Knowlton found, in his work among soldiers at Camp Jackson, South Carolina, that no severe reduction in hemoglobin was caused by less than 500 worms. The hemoglobin of thirty-three of his patients each of whom had fewer than this number of worms, was between 80 and 89 per cent.

Importance of other Factors which Lower the Hemoglobin Index. Of course, not all anemia encountered among the people in infected regions is to be attributed to hookworm disease. Malaria and underfeeding, to say nothing of other devitalizing diseases and conditions, play important parts. The hemoglobin index of all 109 prisoners in the jail at Batavia, Java, for example, was 25.8 points below the normal 95 per cent. Experiments indicated that a loss of 6.8 points was due to hookworm disease, of 10.3 to malaria, and of 8.0 to hard labor. Again, in Fiji, where there is no malaria, underfeeding resulted in a group of East Indians having 9.5 per cent lower

hemoglobin than another well-fed group of the same race. Both groups harbored the same number of hookworms.

Varying Effect of Equal Numbers of Worms Upon Men, Women, and Children. The Board's Uncinariasis Commission to the Orient, working with large numbers of persons from whom practically all hookworms had been expelled by vermifuge and counted, found that on the average, in the presence of the conditions that obtained in the areas dealt with, twelve hookworms caused a reduction of 1 per cent in hemoglobin. An equal number of worms produced more anemia among children than among women, and more among women than among men. Furthermore, when the types of infection resulting from equal numbers of *Ancylostoma duodenale* and *Necator americanus* were compared, it was found that the former produced a more severe form of the disease than the latter.

II

EFFECTS OF HOOKWORM INFECTION

Hookworm infection works subtly through long periods of time. Its cumulative effects are handed down from generation to generation. The disease destroys economic efficiency and social development on the one hand, the while it undermines physical and mental health on the other. It is a menace and an obstacle to all that makes for civilization. As a handmaiden of poverty, a handicap of youth, an associate of crime and degeneracy, a destroyer of energy and vitality, it stands in the very forefront of diseases. Its effects express themselves in stunted physical and mental growth, blighted health and efficiency, retarded economic progress, and general degeneracy and decay. Labor is impaired, home standards are lowered, mental development is inhibited, and there is a tendency for the human machine to wear out before its time. Wherever treatment is systematically carried out and followed by rigorous control of further infection, marked improvement in health and general capacity results.

PHYSICAL RETARDATION

Hookworm disease saps the strength by such imperceptible stages that usually the patient himself does not sense any change in his physical condition from day to day, until his powers of resistance eventually become so lowered that the germs of tuberculosis, of pneumonia, of typhoid fever, or of some other acute infectious disease find favorable lodgment, and all too frequently a fatal outcome results. Statistics show that the mortality rate of hookworm is greatly exceeded by the rates of the more spectacular diseases. But by its steady sapping of the strength of millions of people, continued without interruption over many generations, hookworm disease causes human misery and suffering of a much more severe character than its low death rate would lead one to expect.

Retardation as Measured by Hemoglobin Content. In Costa Rica, Nicaragua, Panama, and a number of other countries,

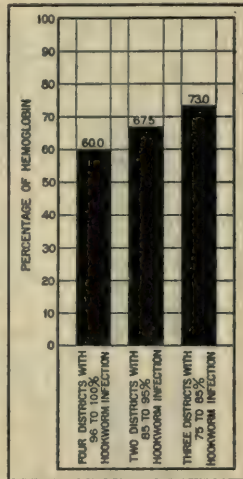


Fig. 28.—Relationship between percentage of hookworm infection and hemoglobin index. Nine districts of Porto Rico

blood examinations have been made with a view to determining approximately the degree of anemia which is associated with the infection. Among a total of 194,021 persons whose blood has been examined to date, three-fifths had a hemoglobin index below 70 per cent. By far the largest number of cases in any single group (91,190) fell between 50 and 69. Twenty-two thousand, six hundred cases were between 30 and 49, while 2,842 were between 10 and 29, and 226 were below 10. Of course not all this anemia is due to hookworm

infection, as hard labor, underfeeding, malaria, and a number of other devitalizing diseases and conditions play their parts in impoverishing the blood.

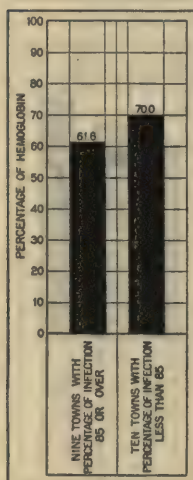


Fig. 29.—Relationship between percentage of hookworm infection and hemoglobin index. Nineteen towns in state of Minas Geraes, Brazil

those after treatment, of 76 per cent.

That the hemoglobin index continues to rise for a considerable period following the close of regular campaign measures, is suggested by observations made on the estate of Rodeo, in the canton of Mora, Costa Rica. On this estate the average hemoglobin index of persons just cured was 63.3. In a re-survey conducted two years later, it was 76.8 among the persons remaining uninfected.

Increase in Hemoglobin Following Treatment. From a number of countries, distinct gains in hemoglobin have been reported among groups of infected persons after treatment for hookworm disease. In Porto Rico, the average hemoglobin as estimated for the total population over a large area where the test was made, was raised from 43 in 1904 to 72 in 1914; in Dutch Guiana the average hemoglobin in a group of infected persons was 71 before treatment and 90 six months or more afterward; in five towns of Nicaragua the hemoglobin index of infected persons rose from 61 to 74 as a result of treatment; in two areas of Panama, from 59 to 68; and among a small group in Chiengmai province, Siam, from 65.5 to 77.5.

During 1917, 1918, and 1919, the director of the work in Costa Rica had opportunity to test the blood of 62,124 infected persons before treatment for hookworm disease, and of 21,787 of the same persons (35 per cent) six months or more after they had been treated.¹ The examinations before treatment showed an average hemoglobin of 64 per cent;

¹ It would, of course, be preferable to confine the comparison before and after treatment to the same number of persons. However, since the cases examined after treatment were taken at random and large numbers were involved, the figures are doubtless sufficiently accurate for practical purposes.



Fig. 30.—Retardation in growth, due to hookworm disease. Two sisters, one on left twenty-one years old and heavily infected; one on right seventeen years old and lightly infected. Ceylon



Fig. 31.—Tamil boy, before treatment for hookworm disease. Age 7, weight 32 pounds, hemoglobin 60 per cent. Bed-ridden for nearly a year



Fig. 32.—Same boy as Fig. 31, six months later, after being cured of hookworm disease. Able to participate in boyish games

Gain in Body Weight by Siamese Soldiers. It is customary for striking gains in body weight to follow treatment for hookworm disease. Such improvement in individuals has often been noted, and large numbers of separate instances could be cited of remarkable increases in weight within short periods of time. During 1918, Hluang Boriracksha, of the Siamese Army Medical Service, made observations on ninety-nine soldiers of the Siamese Army. All of these men had hookworm disease. Sixty-nine of them were treated once with fifty grains of thymol. The other thirty were given no treatment whatever. The treated men gained an average of 10.6 pounds in weight over a period of one year, while the untreated gained during the same period an average of only 1.1 pounds.

Hookworm as a Factor Predisposing to Other Diseases. The 1918 influenza epidemic in Ceylon showed that on all the estates embraced within the Maskeliya area, with a total laboring population of 17,838, the death rate from influenza and its sequelae was twice as high among persons who had not been treated for hookworm disease as among those who had. The deaths numbered 111, or 7.5 per thousand, among 14,659 persons who had been treated for hookworm infection before being attacked by influenza, as compared with 43, or 13.8 per thousand, among 3,253 persons who had not been treated for hookworm. Similarly, Major Kofoid, of the United States Army Medical Service, reports that the hospital statistics and sickness records of 24,000 men at Camp Bowie during the period from October, 1917, to May, 1918, indicated that the resistance to disease was lowest and the mortality rates were highest among the organizations in which hookworm disease was most prevalent.

Reduction of Morbidity Following Hookworm Campaigns. That improved health follows treatment for hookworm disease is illustrated by the following instances:

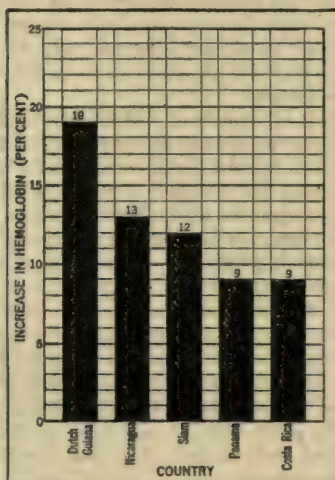


Fig. 33.—Increase in hemoglobin following treatment for hookworm disease.² All countries

² The figures indicate the difference between the hemoglobin index of infected persons before treatment and their index after treatment.

a. Decrease in admissions to estate and asylum hospitals in Trinidad. On one estate in Trinidad, as well as at the Orphanage and Industrial School located at Tunapuna in that colony, sanitary reform and the treatment of infected persons reduced by two-thirds the number of patients admitted to hospital. The work in the Orphanage was completed in April, 1916. During the last two months of the year, only three patients were admitted to the hospital, as compared with a monthly average of forty admissions for the previous four years. In another institution in the same colony, the Boys' Reformatory, the regular hookworm control measures were completed in March, 1918. Before the boys had received treatment for hookworm disease, sixty or seventy ulcers had to be dressed daily; two months after treatment had been begun only seventeen ulcers remained, and of that number, only three were serious enough to require much attention.

b. Diminished sickness in areas of British Guiana. From the Peter's Hall and Belle Vue districts of British Guiana, where operations against hookworm disease were in progress during 1914 and 1915, the number of patients admitted to the public hospital at Georgetown during 1916 was 31.5 per cent lower than during 1914. In contrast with this, the reduction for rural districts in which measures against hookworm disease were not carried out, was only 6.5 per cent.

On one estate in this colony the amount of sickness had increased to such an extent that before the laborers were treated for hookworm disease an addition to the estate hospital was planned. As a result of the hookworm campaign which intervened between the planning of the addition and its erection, the addition was found unnecessary. So great was the reduction in the sickness after hookworm disease had been treated, that even the original quarters were seldom filled to capacity.

c. Lowered record of sickness calls on Ceylon estates. On seven estates of Ceylon there was a decrease of 1,132 sickness calls, or 44 per cent, for four months of 1917, following treatment of the laborers for hookworm disease, as compared with the same four months of 1916, before the laborers had been treated for the disease. The largest reduction occurred in the calls for second and third treatments, indicating that the improvement in health effected by treatment for hookworm disease resulted in the patients being more readily cured of all their maladies. The decrease in bowel complaints and in malarial fevers among the coolies on these estates was especially marked.

In another area the District Medical Officer reported that only 2,604 patients were admitted to hospital in 1918, after treatment for hookworm disease had been carried out in his locality, as compared with 3,694 in 1916, before systematic work against the disease had been begun. This represents a reduction of 27 per cent in the number of hospital admissions.

d. Lessening of sickness absenteeism on Indian tea estates. The investigation conducted by Lieut.-Col. Clayton Lane in the Darjeeling district in India showed that treatment resulted in noticeable improvement in the health and efficiency of labor. One manager wrote Dr. Lane that during the three months preceding the campaign against hookworm disease, at least forty-five men were continuously absent from work because of sickness. During the same three months of the following year, after the hookworm campaign, only twenty-six men were laid off for this reason—a reduction of 42 per cent. Another manager reported that prior to the time treatment was given his laborers, between 150 and 200 of them were absent from work daily during the rainy season. In 1918, after treatment had been administered, the number daily absent from work during the rains never exceeded sixty, and usually was considerably less than this figure.

Effect of the Disease on the Birth Rate. It is probable that hookworm disease has a deterrent effect upon the birth rate. Not only do the sterility and impotence commonly caused by the infection reduce the frequency of conception, but the effects of the disease, falling most heavily on women of child-bearing age, cause a large proportion of the pregnancies that do occur to terminate in abortions or miscarriages. Wherever treatment is carried out over large areas, the birth rate is stimulated in marked degree. Many women become pregnant who have not borne children for years. The regularity of menstruation is restored, sterility reduced, the number of pregnancies correspondingly increased, and the proportion of unfavorable terminations reduced. This is a fact of vital economic significance in view of the present shortage of man-power throughout the world.

MENTAL RETARDATION

During 1918 the Ministers of Public Instruction in Nicaragua and Salvador issued decrees calling for the examination of all school children for hookworm disease and for the treatment and cure of those infected; and the Prefect of the Federal District of Brazil, similarly, ordered the examination and treatment of the pupils in the public schools of the city of Rio de Janeiro. These acts were prompted by recognition of the fact that aside from its baneful influence in retarding physical development, hookworm disease causes a further loss to the state by impairing the intellectual character and capacity of its citizenship.

Comparative Scholarship Gradings of Infected and Non-Infected. Lists of the children found infected usually correspond with those of the dullest pupils in their grades. In one women's college in the Southern States, for example, the average standing of fifty-six students found infected was 78 per cent, whereas fifty-six students found free of infection averaged 89 per cent. In another

instance, twenty-five infected boys in a Southern academy averaged 64 per cent in their studies, as compared with the percentage of 86 maintained by the same number of non-infected boys. Here the retardation was approximately 25 per cent. Teachers everywhere are practically unanimous in reporting that treatment of the infected pupils results not only in marked gains in weight and physical appearance, but in decided improvement in zeal and intelligence as well.

Mental Retardation from Hookworm Disease in U. S. Army.

Major Kofoed reports, on the basis of his experience with hookworm disease among troops in the Southern Department of the United States Army, that when the findings of the hookworm survey were compared with those of the psychological board in the case of 10,000 men at Camp Travis, Texas, the mentality of white men with hookworm disease was found to be about 33 per cent below the mentality of those without it.

Study of Mentality of Infected Children in Queensland.

During 1918 a thorough investigation was made of the mental retardation due to hookworm infection among the school children of Queensland, Australia. The study was made possible by the Queensland Department of Public Instruction, which provided a school nurse for six months and all necessary facilities for carrying out the work. Three hundred forty children between the ages of six and fourteen years were selected for mental testing. As far as possible, effort was made to obtain a fair representation of the 5,000 or more school children residing within the areas visited, both as to strata of society and the sections of town or country from which they came. The children

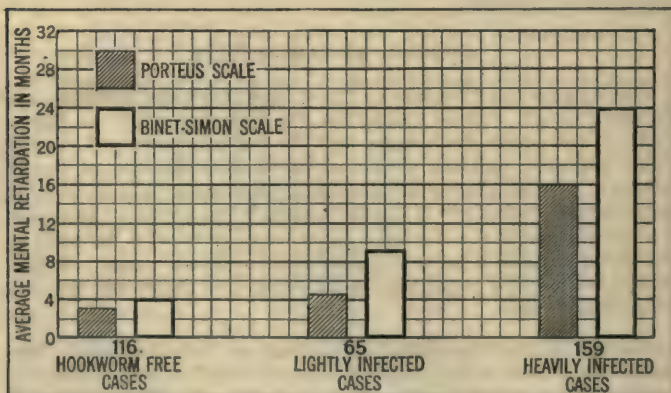


Fig. 34.—Comparative mental retardation, in months. Hookworm free, light hookworm infections, and heavy hookworm infections. Three hundred forty school children of Queensland, Australia. 1918

selected fell naturally into one of three groups, according as microscopic examination of the fecal specimens which they submitted showed that they were not infected, only lightly infected, or heavily infected, with hookworm disease.

Measures of Mentality Employed in Queensland Study.

The method of selection on the basis of stool examinations kept a constant factor of other causes of retardation, such as hereditary mental defects, syphilis transmitted from parents, parental alcoholism, tonsils and adenoids, and so forth. The tests were applied by the nurse, without knowledge as to what result the microscopic examination of the child's feces had yielded. Goddard's revision of

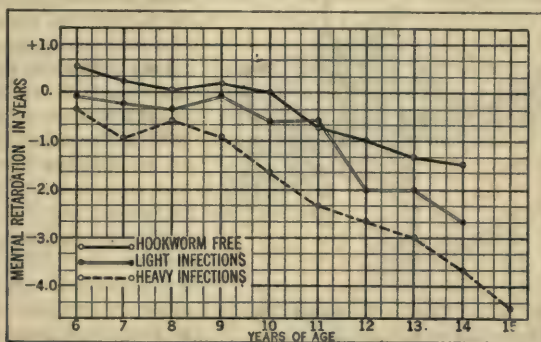


Fig. 35.—Results of Binet-Simon mental tests by age groups. Three hundred forty school children, Queensland, Australia. 1918

the Binet-Simon tests, the Porteus mazes, and a special modified dot-counting test were employed in gauging the mentality of the children. In using the Binet-Simon tests, special adjustments were made to adapt them to Australian children. From thirty-five to forty minutes were taken for applying the tests to each child.

Findings of Queensland Mental Retardation Study. Figs. 34 and 35, pages 146 and 147, exhibit graphically the principal facts disclosed by the survey. Lightly infected cases had, on the average, a retardation of 9.3 months in their mental development as measured by the Binet-Simon tests, and of 4.9 months as measured by the Porteus; while heavily infected cases were retarded 23.4 months as measured by Binet and 16.6 months as measured by Porteus. The longer the infection had persisted in the child, the greater was the retardation found to be. Thus, in infected children eight years old the retardation was only 6.6 months, while in those eleven years old it was 19.0 months and in those fourteen years old, 25.9 months. In extreme cases accompanied by the most severe types of individual infection, a retardation of as much as five years was recorded.

III

DIAGNOSIS OF HOOKWORM INFECTION

Measures for the relief and control of hookworm disease, to be of the greatest value, must be conducted in such manner that their benefits will not only reach the more advanced and prosperous peoples, but also extend to the many millions of primitive folk who

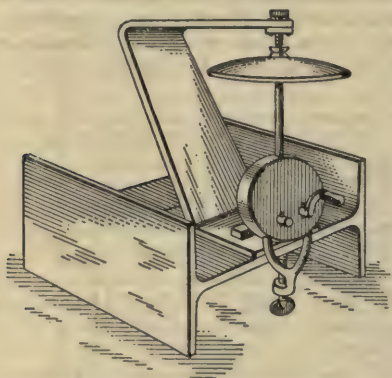


Fig. 36. — Winsor's stand for increasing speed of centrifuge

inhabit the more remote and inaccessible regions of the earth. This means that field activities must often be carried out under conditions far from ideal. In all of the Board's work the aim has been to achieve accuracy and simplicity. If the latter requirement is to be met, the apparatus and equipment cannot be elaborate, nor should extensive preliminary training on the part of the examiners be necessary. Another cardinal point is to keep the expense within the means of the community; otherwise there can be no world-wide hookworm control.

Methods of Diagnosing the Infection. The disease may be diagnosed by administering a vermifuge and searching the stools for hookworms, or the vermifuge may be omitted and specimens of feces may be microscopically examined for ova. It has been customary to rely almost entirely upon several variations of the latter method. There are also various culture methods for demonstrating the infection, but these are hardly practicable for extensive use in the field.

How Fecal Specimens are Received and Examined. When microscopic examination of the feces is the basis for demonstrating the disease, every person in an infected area is invited to submit a specimen of his feces for examination. For this purpose are supplied small tin boxes about one inch in diameter, with the lid of each properly marked for identification. Every effort is made to insure careful and accurate diagnosis of the specimens submitted. In each country the examiners are native young men who have been especially

selected for their reliability, and carefully trained in the detection of ova. The specimens found negative by one man are in almost all cases re-examined by one or two others, and head examiners are usually employed to watch over the work and safeguard the accuracy of the results.

MICROSCOPIC DIAGNOSIS WITH PLAIN SMEAR

Until 1914 the plain smear method of microscopic examination was used almost exclusively. This consists of the careful search of not less than three smears from each specimen before pronouncing free of infection the person who submitted it. The glass slides on which the smears are examined measure not less than 1"x3". The disadvantage of this method lies in the fact that it requires more time for thorough examination than can well be devoted to each specimen. Furthermore, the specimens themselves are too small to yield entirely trustworthy results. Nevertheless, the method gives fairly good results when large or moderate numbers of the parasites are harbored.

DIAGNOSIS WITH THE AID OF THE CENTRIFUGE

When only a few worms are harbored, the number of eggs in the feces is, of course, correspondingly reduced. It then becomes necessary to employ a ready means of concentrating the eggs, not merely to facilitate the search but also to insure a greater degree of accuracy in the findings. In recent years a multiple-tube hand centrifuge, which goes far toward meeting these needs, has come into general use. When this machine is employed, two or three slides from each specimen are first examined by the ordinary plain smear method. Those specimens which seem to be negative by this process are set aside and centrifuged in groups of twenty; and from the concentrated sediment thus obtained, two or three slides are usually prepared from each specimen for further examination with the microscope. Experiments have shown that the number of specimens found positive is about 20 per cent higher when the centrifuge is used than when the ordinary plain smear method alone is relied upon for diagnosis.

Use of Centrifuge Stand. Dr. S. A. Winsor, in Ceylon, found that by the use of a stand such as is pictured in Figure 36, page 148, the speed of the centrifuge may be considerably increased. The increased speed causes the ova containing sediment to adhere more closely to the cork at the lower end of the centrifuge tube. The close packing insures against the possibility of a considerable portion of the sediment falling back when the tube is tilted to remove the cork.

METHOD OF EMULSIFYING STOOLS FOR CENTRIFUGATION

According to the usual method of preparing stools for centrifugation, a small quantity of feces—4 to 5 grams—is placed in a flat-bottom glass vial. To this specimen is added ten or more times its bulk of water. The water and feces are stirred together until an emulsion is made. The emulsion is then poured into a centrifuge tube through a glass or paper funnel in which are placed two or three layers of gauze, which serve to remove the larger particles from the fluid.

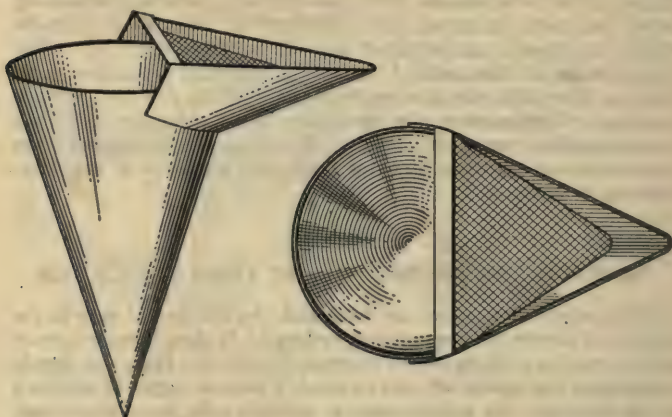


Fig. 37.—Waite's special grooved tin cone for pouring fluid stool into centrifuge tube

Dr. J. H. Waite devised a method of emulsifying stools in which he substituted for the glass mixing vial a tin cone grooved at the top to facilitate pouring a small stream of fluid stool into the centrifuge tube (Fig. 37). This method obviated the need of a funnel. The cones are cheap, unbreakable, and easily packed for transportation. They allow more rapid and more complete emulsification of the stool than a flat-bottom vial, because the unbroken stool particles gravitate to the apex of the cone where they can easily be macerated with a tooth pick.

During 1919 a director in Ceylon devised an improvement for this apparatus, in the form of a fine-mesh strainer which is fitted into the groove through which the feces are poured into the centrifuge tube.

Levitation Method of Preparing Slides from Centrifuged Specimens. Clayton Lane recommends a new technique of slide preparation, which he designates the "levitation method." Accord-

ing to this procedure the concentrated sediment of the centrifuged specimen is transferred to a glass slide, where it is thoroughly mixed with one mil of water and spread out evenly over an area within the limits of the range of the mechanical stage. The slide is allowed to stand for five minutes, and is then immersed in water and manipulated until all coarse matter has floated free. By this process nearly the entire amount of obscuring matter can be removed and, owing to the tendency of hookworm ova to stick to a slide after once settling, very few eggs are washed away. Lane reports that on an average the levitation method results in a ten-fold concentration of ova. By its use it has been found possible to collect and count upon a slide area of 2x1 inches, 2,227 hookworm ova from a stool specimen of one-half mil.

Accuracy of Centrifuge Method. The accuracy of the centrifuge method, like that of the plain smear method, depends primarily upon a fecal sample that is too small to yield entirely trustworthy results. The Board's Uncinariasis Commission to the Orient found, in the Federated Malay States and in Fiji, that when the same groups of persons were examined first by the centrifuge method and later by administering a vermifuge and straining the stools for worms, the microscope showed only from 75 to



Fig. 38.—Special type of hand centrifuge used in examining specimens
(Top) Stewart panhead, with specimen tubes in position
(Bottom) Shaft showing manner of clamping to table

85 per cent of the persons examined to be infected, while diagnosis by vermifuge revealed from 94 to 100 per cent. It seems well within conservative bounds to estimate that in examinations both before and after treatment, diagnosis by microscopic examination, aided by the centrifuge, yields evidence of infection varying from 4 to 25 per cent less than that which actually exists. In support of this statement the evidence afforded by experiments made in Brazil during 1918 may be cited.

Summary of Experiments in Brazil During 1918. One hundred two among the total of 280 test cases treated in Brazil during 1918 were reported negative on original microscopic examination; thus the percentage of infection was 63.6. All 102 of the negative cases were later treated and fifty-six of them expelled worms, so that the actual rate of infection was not less than 83.6. All of the original examinations were made by trained microscopists with the aid of the centrifuge, and yet the result shows a difference of 20.0 per cent in favor of diagnosis by vermifuge. The fifty-six cases incorrectly diagnosed yielded 716 worms, or thirteen per infected case. One of the cases declared negative on microscopic examination expelled as many as 115 worms.

GLYCERINE-SALT PROCESS OF EXAMINATION

It seems that infections which escape detection by the combined plain smear and centrifuge methods represent cases which harbor comparatively few worms. Nevertheless it is of considerable importance that these mild infections be correctly diagnosed.

Two special techniques of examination have lately been developed to meet this need: the glycerine-salt and the brine flotation-loop method. Both make use of specific gravity as an aid to correct diagnosis. The former was developed by Dr. M. A. Barber in his work in the Federated Malay States, and was used by the medical officer in charge of the work in Siam in examining 31,298 specimens in that country up to December 31, 1918. The results obtained from its use are reported to be extremely satisfactory.

Process of Examining by Glycerine-Salt Method. In using the glycerine-salt technique, a diluting fluid composed of equal parts of a saturated solution of magnesium sulphate and glycerine is prepared. This fluid is dropped from a large dropping-bottle into the small tin box which contains the specimen. The fecal mass is thoroughly stirred and broken up with a toothpick, which releases the ova and causes them to rise to the surface. The upper part of the fluid in each container is poured upon a 2" x 3" glass microscope slide which has been rimmed with paraffin or grease, and the surface of the slide is searched for eggs. The entire contents of a container can be examined by preparing three or four of these

slides. The process regularly followed is to examine two slides before and two after centrifuging the specimen. The glycerine-salt diluting fluid is used in preparing all four of the slides, including those made before as well as after centrifuging.

Advantages of the Glycerine-Salt Method. The number of ova brought upon the slide by the glycerine-salt method is so greatly increased that the eggs can be much more easily found than when the plain smear method is used. This reduces the number of specimens that have to be run through the more time-consuming process of centrifuging, and results in a great saving of time. This is an especially important consideration in regions like Siam, where the individual infection is so mild that when the plain smear method is used it is often necessary to prepare from ten to twelve slides from a single specimen and to spend from twenty to thirty minutes making a diagnosis.

Comparative Accuracy of Plain Smear and Glycerine-Salt Methods.

Forty-five test specimens were examined personally by the director of the work in Siam, who used first the plain smear and then the glycerine-salt method. Two slides from each specimen were examined by each method; in neither case was the centrifuge used as an aid. The percentage of persons found infected in examinations by the plain smear

method was 23.3 by the first and 12.2 by the second slide, or 35.5 by the two slides combined. By the glycerine-salt method it was 84.4 by the first and 2.2 by the second, or 86.6 by both slides. With the plain-slide technique a total of thirty-six ova were found on all ninety of the slides examined; with the glycerine-salt technique, a total of 448.

A later series of forty-three specimens was examined by the two methods, but a second slide was prepared only when the first proved negative, and no record was kept of the number of eggs discovered. In this series the percentage found positive by the plain slide method was 37.2, as compared with 67.4 by the glycerine-salt method. For both series, embracing eighty-eight specimens in all, the percentage of positive findings by the two methods was 27.5 and 77.2, respectively.

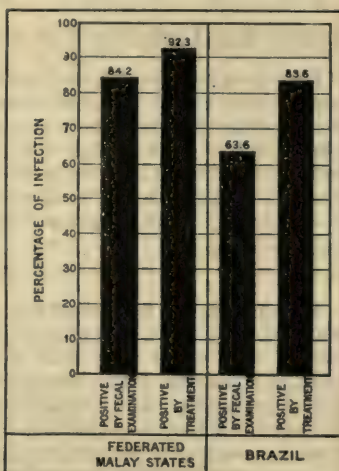


Fig. 39.—Comparative accuracy of diagnosis by fecal examination and by vermifuge treatment. Based on tests in Federated Malay States and in Brazil

Accuracy of the Plain Slide, Centrifuge, and Glycerine-Salt Methods Compared. Twenty-seven of the eighty-eight specimens just mentioned were examined in rotation by the plain slide, centrifuge, and glycerine-salt methods. In this series, record of the number of ova discovered was omitted, and a second slide was not prepared if the first proved positive. The results showed that the glycerine-salt was the most accurate of the three methods. The findings were as follows: 40.7 per cent positive by the plain slide, 55.5 by the centrifuge, and 70.2 by the glycerine-salt method.

BRINE FLOTATION-LOOP METHOD OF EXAMINATION

During 1918 Majors Kofoid and Barber developed a special technique known as the "brine flotation-loop method," and employed it in examining for hookworm disease the soldiers in the Southern Department of the United States Army.¹ This method is in part an outgrowth of experience with the glycerine-salt method just described. In the army medical work it was used by about seventy-five examiners in making more than 100,000 examinations under field conditions, and was found to be rapid, efficient, practicable, and especially valuable in diagnosing light infections.

Technique of Examination With Brine Flotation-Loop Method. The process followed in making examinations by this method is to mix a large fecal sample thoroughly in concentrated brine in a paraffin paper container of from 50 to 75 mils (2 to 3 ounces) capacity. The coarse float is forced below the surface by means of a disk of No. 9 steel wool, and the container is allowed to stand one hour for the ova to ascend. The surface film is then wiped off with wire loops $\frac{1}{2}$ " in diameter and examined on a slide without a cover glass. The ova of hookworms and of other parasites are floated up by the brine into the surface layer of the pool without distortion or noticeable change in appearance.

Advantage of Flotation-Loop Process. The great advantage of this method is believed to lie in its easy utilization of large samples. With containers of sufficient size, receptacles for mixing the entire stool can be employed. This eliminates the element of random sampling, except in so far as this may be due to irregular egg-laying by the female worms or to an unequal discharge of eggs in successive stools. It insures also a sufficient number of ova to make detection possible in infections light enough to be overlooked by other methods using smaller samples. It is for this reason a more accurate means of diagnosis. In addition, it is reported to be about 50 per cent more rapid than the centrifuge method.

¹ For full particulars, see article entitled "Rapid Method for Detection of Ova of Intestinal Parasites in Human Stools," by Charles A. Kofoid and Marshall A. Barber, *Journal American Medical Association*, vol. 71, No. 19, p. 1557.

Accuracy of Flotation-Loop Process. The accuracy of this method depends on a number of variables, including the size and consistency of the specimen, the thoroughness of stirring, the amount of steel wool used, the care in looping, the opacity of the fluid, and the extent and thoroughness of the search made of the material on the slide. Eight lots of fifty specimens each, which had been examined once, were set aside and subsequently re-examined for the purpose of ascertaining what proportion of light infections had escaped detection. The specimens were all from companies of soldiers in which there was light and therefore presumably easily-overlooked infection, and all had been found negative on the first examination. The top float of each of fifty cans was drawn off into a tall cylindric liter graduate, and the surface film of this column was examined. The cans had stood, after stirring, for not less than two or three hours. In order to avoid entangling any ova that might be present, no brine from thick or viscous stools was used. Only one specimen among all eight lots, or one in 400 negatives, was found positive on second examination. From this it appears that the number of positives escaping detection by this method is practically negligible.

CALDWELL MODIFICATION OF THE FLOTATION- LOOP METHOD

Dr. F. C. Caldwell calls attention to two difficulties which present themselves when the brine flotation-loop method of examination is used in the ordinary field work of the International Health Board. First, the large amount of fecal material required by this technique necessitates a mixing container of more than regulation size; and secondly, the time required to secure adequate comminution of each specimen renders the method tedious under field conditions where a large number of specimens are to be examined.

Special Caldwell Comminution Apparatus. During 1919 Dr. Caldwell devised an apparatus which obviates the foregoing difficulties by providing for the thorough comminution of a number of specimens at one time and by permitting the use of the regulation container. The apparatus consists of two pieces (plates) of wood or metal joined by means of two bolts. The upper plate contains sockets for ten tubes of sufficient size to hold the ordinary specimen containers. The tubes used in the apparatus are closed at one end, and each socket of the upper plate is provided with a thin layer of cork so that when the apparatus is fastened together the tubes are sealed. Containers holding fecal specimens are dropped into the tubes. A few pieces of shot are added to each container, and the tubes are filled to three-quarters of their capacity with concentrated salt solution. The upper plate is then screwed into position and the apparatus is thoroughly shaken. After this process the floating

matter is removed and prepared for examination according to the Kofoid-Barber technique. In the laboratory tests in which the apparatus has been used, it has been found to give a much better concentration than the centrifuge; and since it permits of the use of a large amount of material, it gives a more decisive test.

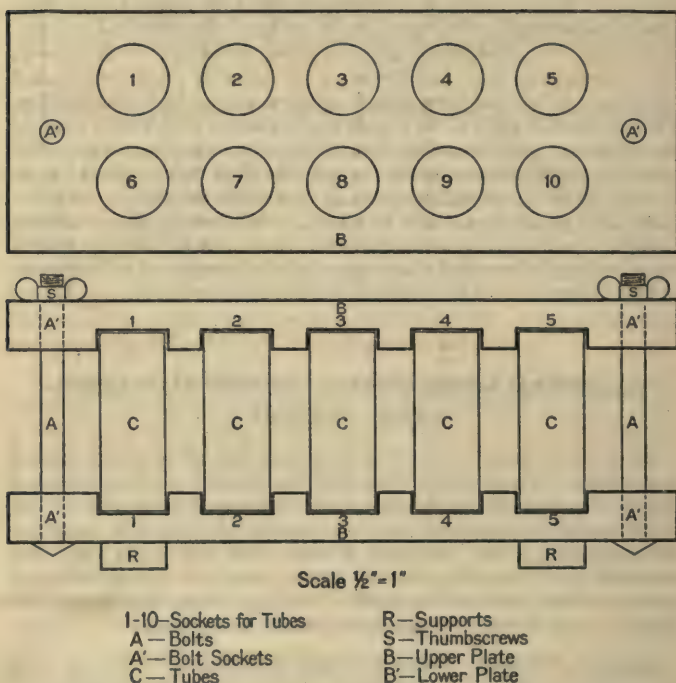


Fig. 40.—Caldwell's apparatus for facilitating comminution of feces

WINSOR VARIATION OF THE FLOTATION- LOOP TECHNIQUE

Dr. S. A. Winsor, in his work in Ceylon during 1919, found that with the use of the ordinary brine flotation-loop process considerable difficulty was experienced in preserving the contour of the egg and in eliminating from the floating matter of the fecal emulsion substances which obstructed the microscopist's view of the ova. By the use of the following technique he has been able largely to over-

come these difficulties. In an ordinary mixing cone, about ten grains of feces are thoroughly stirred with ten drops of water. The cone is then filled to three-quarters of its capacity with saturated sodium chloride solution containing 1 per cent of commercial acetic acid. A thin layer of absorbent cotton is spread over the top of the mixing cone, with the margins overlapping the edge, and is pressed down as far as possible with a wire loop. The fecal emulsion containing ova rises above the cotton, while the larger floating particles are eliminated. The emulsion is poured into a concentrator and allowed to stand from ten to thirty minutes before being transferred to a slide for examination. If permitted to remain longer in the concentrator, the eggs tend to become crenate and scarcely recognizable.

IMPRACTICABILITY OF SCIENTIFICALLY EXACT DIAGNOSIS

When a person is declared free of infection on microscopic examination, the term "free of infection" is used in a relative sense to indicate that the number of worms in the intestines is so small that no ova can be discovered in the feces. This does not necessarily mean that there is not a single hookworm present. Male worms may still be harbored, as there is no possible way of knowing that none of these remain except by administering repeated treatments and washing the stools after each treatment. Nor is it possible to say that not a single female worm inhabits the intestinal tract unless specimens of stool are examined every day for many days for the presence of ova. But it can be stated definitely that if careful examination by the methods in use fails to show the presence of ova, the number of worms remaining is very small. If patients are willing to submit two or three specimens for examination, the removal of every parasite could be more definitely predicated, but this would entail a large amount of additional work and present many difficulties if attempted under field conditions.

DIAGNOSIS BY ADMINISTRATION OF VERMIFUGE

The most accurate method of diagnosing hookworm infection is by administering vermifugal treatment and examining the stools for the presence of worms. This method of diagnosis is of especial value for determining both the type of hookworms harbored by patients and the degree to which the latter are infected. It is not, however, practicable as a routine field measure. The procedure employed by the Uncinariasis Commission to the Orient, when diagnosing infection by this method, was as follows:

On the morning of the day preceding treatment the persons to be examined were allowed their usual diet. In the afternoon they were given some rice and gruel and a half pint of milk, and at 5:00 p. m.

a purgative was administered. On the morning of treatment, food was generally withheld, although in some cases a little milk was permitted. The vermifuge was administered in three doses at hourly intervals. Two hours after the last dose a second purge was given. At 12:30 noon the patients were allowed to drink milk, and in the afternoon they were given a little rice and bread. The next day they were allowed rice and curry, but vegetables with coarse fibers were prohibited because they might have interfered with the search for worms. Stools were examined for worms until seventy-two hours had elapsed. Six stools per case were usually obtained during this period.

Method of Washing Stools. A regular routine was followed in the washing of stools. Those that were soft or fluid were washed at once; the more compact stools were mixed with water and stirred until soft. The washing was done by means of a jet of water played with moderate force into a large brass wire sieve (mesh 50 to an inch) into which the feces had been poured. The washed stool was distributed into photographic developing trays, a small portion into each tray. A dark brown tray was found to furnish the best background for the worms. These were then picked out with needles or forceps and placed in properly numbered Petri dishes containing normal salt solution. Later the excess salt solution was drained off and the worms were killed by flooding the dishes with boiling alcohol (70 per cent). When the worms are scalded they become rigid and assume the shapes that are characteristic of their species. This renders differentiation comparatively easy and the worms can be rapidly counted.

IV

METHODS OF TREATING HOOKWORM DISEASE

The principal remedies used in the treatment of hookworm disease are chloroform, eucalyptus, beta-naphthol, thymol, and oil of chenopodium. A new drug known as *carvacrol* was tried during 1918, but the results attending its use were reported as unsatisfactory. Of the five drugs most extensively employed, thymol and oil of chenopodium have proved themselves superior to all the others under field conditions. Chenopodium during recent years has been gaining steadily in favor.

Comparative Efficiency of Thymol and Chenopodium.

In a number of experiments conducted by the Board's Uncinariasis Commission to the Orient, for the purpose of reaching a scientific conclusion as to the relative merits of chenopodium and thymol for routine treatment, chenopodium in small doses proved more efficacious than small doses of thymol. In larger doses the drugs showed approximately equal efficacy in removing Necators, but chenopodium proved superior to thymol in removing *Ancylostomes*, the more resistant species of hookworm. There was failure to cure the patient (by removing all hookworms harbored) in 23.6 per cent of the cases treated with thymol, as against only 7.6 per cent of the cases treated with chenopodium. A test vote taken in the course of the work indicated that nearly all patients preferred chenopodium as being less unpleasant to take than thymol.

Relative Cost of Treatment with Thymol and Chenopodium.

When the treatment of large populations is contemplated the comparative cost of the drugs employed is an important consideration.

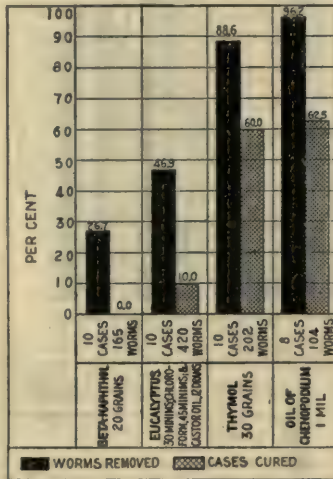


Fig. 41.—Comparative efficacy of beta-naphthol, eucalyptus, thymol, and oil of chenopodium. Based on experiments with thirty-eight cases in studies of Uncinariasis Commission to the Orient

A series of experiments designed to furnish an estimate of the relative cost of treatment with chenopodium and thymol, was conducted by the Uncinariasis Commission to the Orient in February, 1917. At this time the price of chenopodium was 1.84 cents per mil, and the price of thymol was 0.15 cents per grain. The dosage of chenopodium which proved most satisfactory as a routine vermicide was 1.5 mils administered in three equal doses of .5 mils each. On this basis the cost per individual for the chenopodium treatment amounted to 2.76 cents. The dosage of thymol which proved to be most satisfactory was one treatment consisting of 60 grains divided into three equal parts. With this treat-

ment the cost of thymol per individual was 9.0 cents. It will be seen therefore that the cost of treatment with chenopodium was less than half as much as the cost of treatment with thymol (Fig. 42).

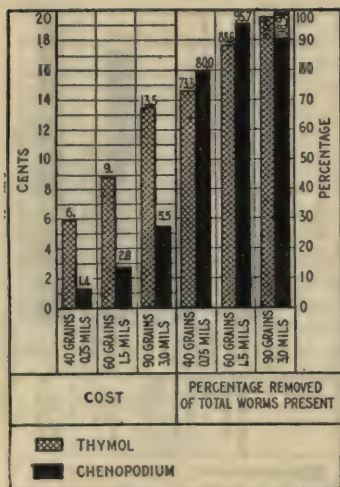


Fig. 42.—Relative cost and comparative efficacy of thymol and chenopodium. Based on studies of Uncinariasis Commission to the Orient

Properties of Chenopodium Not Fully Understood.

It seems, however, that there are on the market a number of varieties of chenopodium which differ greatly in strength and toxicity. The variations in different samples are especially noticeable in the chemical composition of the oil, and are exhibited in its appearance, taste, smell, specific gravity, and volatility. During 1919, there was marketed a supply of the oil which proved highly toxic in effect and which caused several fatalities. More than half of these deaths occurred after second or even third

treatment, when previous treatments had been well supported. The oil was paler in color and of less density than the ordinary product, and was characterized by an extremely acrid odor. Samples of this oil were secured and submitted to Dr. E. K. Nelson, of the United States Department of Agriculture, who is now engaged in a series of studies which it is hoped will throw light on the varying efficacy and toxic effects of different specimens of the oil. Until such time as proper standardization of the drug can be effected, it seems advisable to repeat the earlier caution that medical officers should exercise careful supervision over the administration of the

oil in the field, and that the dosage for children should be made smaller than is indicated by Young's rule.

Experiments in Distilling and Testing Chenopodium.

With a view to arriving at a better pharmacopeial standard for the preparation of oil of chenopodium, Hall and Hamilton made a study of the composition of the drug and the anthelmintic value of some of its components. They report that their tests of the distillation products of the oil indicate that the greatest anthelmintic efficacy resides in the lightest fraction of the drug. As the heavier fractions are used the efficacy shows diminution. Moreover, the heavier fractions cause marked gastro-intestinal irritation, and in dosage equivalent to the standard therapeutic dose of the oil, produce hemorrhagic conditions of the stomach and intestines even in the presence of castor oil, which is highly protective. Hall and Hamilton believe that the value and safety of oil of chenopodium would be greatly increased if the ordinary marketed product were re-distilled at a temperature up to 125° C. (257°F.) with a pressure equal to 30mm. of mercury. This process would eliminate that fraction of the drug which has less anthelmintic value and more irritant and toxic qualities than the lighter fraction.

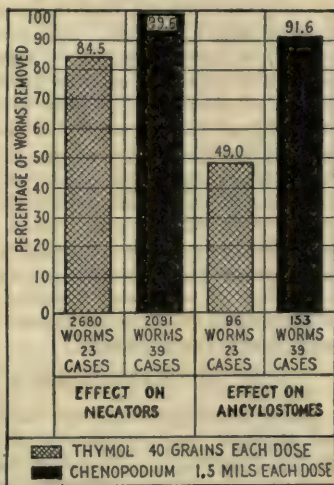


Fig. 43.—Comparative efficacy of thymol and oil of chenopodium in half-maximum doses. Based on experiments with sixty-two cases in studies by Uncinariasis Commission to the Orient

STANDARD TECHNIQUE OF THYMOL ADMINISTRATION

The routine dosage of thymol recommended by Stiles, Dock Howard, Bass, and others of wide experience in the treatment of hookworm disease, is the one most commonly employed in the countries where thymol is used. It is based upon 60 grains as the maximum for an adult, preceded and followed by an active saline purgative. Children from one to five years of age receive from 3 to 5 grains of the thymol; those from six to ten, from 10 to 15 grains; and those from eleven to fifteen, from 15 to 30 grains. Persons between sixteen and twenty years of age receive from 30 to 40 grains; those between twenty-one and fifty years, from 45 to 60 grains;

and those more than fifty years, from 30 to 45 grains. The drug is usually administered in finely powdered form, mixed with equal parts of milk sugar or sodium bicarbonate. It is given in two equally divided portions, and apparent (not actual) age determines the dosage. Competent physicians examine all patients who are to take the drug, prescribe the proper dosage for each, and supervise the important phases of the treatment.

Conditions Governing Administration of Thymol. Food is not allowed from the time of the first purgative until after the final dose of salts has acted. Inasmuch as alcohol and oils, and gravy, butter, milk, or other fatty foods, are especially dangerous, the patient is cautioned against taking them at any time during the period of treatment. Under field conditions it is generally held that thymol should not be administered to persons suffering from acute diseases such as malaria in the febrile stage or fevers of any other type; those having chronic dysentery or diarrhea, organic cardiac or renal disease, pulmonary tuberculosis beyond the incipient stage, or general anasarca; those who are extremely weak or feeble from old age or from other cause; and pregnant women, or women with serious hemorrhagic diseases of the uterus. Thymol may be administered to persons suffering from any of these diseases only when the circumstances will permit rigid control of all features connected with the treatment.

USE OF CHENOPODIUM AS AN ANTHELMINTIC

Oil of chenopodium is now used more extensively than thymol in all countries with which the Board co-operates, except Jamaica, British Guiana, Trinidad, and Saint Lucia. Its comparatively low cost and the relative scarcity of thymol brought about by the World War have doubtless been factors in some measure leading to its wide-spread use. Following the reduction in dosage recommended by the Board's Uncinariasis Commission to the Orient, the drug was employed in administering 437,166 treatments to 191,377 persons during 1918, and gave exceptionally favorable results. In 1919, however, a few fatalities and a noticeable increase in the number of cases of *Chenopodium* poisoning were reported as a result of the administration of 466,456 treatments of the oil to 192,177 persons. The untoward effects which attended the use of the drug during 1919 led to the studies above described, from which it is hoped to learn full particulars as to the pharmaceutical properties of the oil.

Standard Method of Administering Chenopodium. The standard method of administering chenopodium as used by the Board during 1919 was that recommended by Darling, Barber, and Hacker as a result of their experiences with various vermifugal drugs in the Orient and published in their article entitled "The Treatment of Hookworm Infection."¹ It consists of an adult dose of 1½ mils

¹ The Journal of the American Medical Association, February 23, 1918, vol. 70 pp. 449-507.

divided into three equal parts and administered as follows: the first portion at 7:00 a. m., the second at 8:00 a. m., and the third at 9:00 a. m. A light evening meal followed by a purgative dose of magnesium sulphate is usually given on the evening preceding treatment, and a very light breakfast, consisting of milk or thin rice gruel, on the morning of treatment. Two hours after the last portion of chenopodium is taken, a second purgative dose of magnesium sulphate is administered. Effective post-treatment purgation is thought to be essential to eliminate the dead or stunned worms and the unabsorbed oil. A second post-treatment purgative may be given if the first fails to act freely and promptly. Later researches by Mhasker and Caius, however, make it seem doubtful whether effective post-treatment purgation is really required.

Schedule of Chenopodium Dosage for Children and Adults.

The directors of the work in Ceylon, who have made extensive use of the drug in small doses, have worked out a dosage table for children and adults. Children who *appear* to be between the ages of two and twelve years receive 1 minim for each year of age, minus 1 minim.² This means that a child of seven receives 6 minims, a child of six 5 minims, and so on. Persons from thirteen to fourteen years of age receive 13 minims; those from fifteen to sixteen, 16 minims; from seventeen to eighteen, 20 minims; and from nineteen to twenty, 24 minims. It will be noted that especially small doses are administered to children under twelve. The oil is dropped from a dropping-bottle into simple sugar syrup. In Ceylon this syrup has proved the most satisfactory of all the vehicles in which the oil has been administered. The directors of the work in this country also report that in addition to the contra-indications to thymol treatment mentioned on page 162, the use of chenopodium is contra-indicated when the patient has peptic ulcers or gonorrhea.

Efficiency of Standard Chenopodium Treatment. The director and the assistant director of the Department of Hygiene at the University of São Paulo, assisted by the staff engaged in hookworm control measures in Brazil, have made considerable progress toward establishing the probable average efficiency of the foregoing dosage under field conditions. In the original experiments, made in the Orient under laboratory conditions, two standard chenopodium treatments, separated by an interval of ten days, removed 99 per cent of all the hookworms harbored by a group of thirty-nine adults. One hundred fifty-six cases were similarly treated in Brazil during 1918, except that the work was done largely under field conditions, and 97 per cent of the worms they harbored were removed. Thus the Brazilian experiments confirmed, in so far as the smallness of

² Special attention is directed to the fact that a minim by weight equals approximately two drops by measure.

the numbers involved may be accepted as confirming, the tests made in the Orient. A large amount of additional field experience will need to be gained, however, before the entire practicability and efficiency of the routine treatment may be regarded as definitely established. Among the factors remaining for further investigation is the apparent difference in power of resisting treatment between the *Ancylostoma duodenale* and the *Necator americanus*, and between persons who harbor large numbers of worms and those who harbor only a few.

a. *Experiments with standard technique among Brazilian vagabonds.* Eighty-two vagabonds more than fourteen years of age, who lived at an institution in Pinheiro, in the state of Rio de Janeiro,

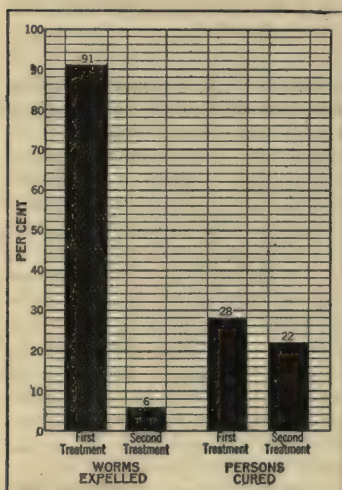


Fig. 44.—Worms expelled and cases cured by two treatments of chenopodium. Eighty-two Brazilian vagabonds

were treated three times with chenopodium. The first two treatments consisted of $1\frac{1}{2}$ mils each and the third of 3 mils.³ These treatments expelled a total of 10,895 worms. Fig. 44 shows the efficiency of each treatment as based on two factors: the percentage of worms expelled, and the percentage of cases cured. In this group there were only nine relative failures of the treatment, or cases which harbored ten or more worms after two $1\frac{1}{2}$ mil treatments had been taken. The conditions of this experiment, however, permitted a rigid control of the patients and approached the exactness of a laboratory test. The results, therefore, cannot be accepted as altogether representative of those to be expected when the remedy is administered in the field.

b. *Tests on heavily infected farm and in lightly infected village.* Two trials were made in Atibaia, Brazil, to determine the efficacy of the standard treatment as administered under field conditions by regular campaign dispensers. In the first test, two localities were chosen: a severely infected farm, and a mildly infected village. Ten persons in each locality were selected for treatment. Each received two routine treatments

³ The third treatment (consisting of 3 mils) is not, of course, a part of the routine chenopodium administration. It was given to insure the quick recovery of all the hookworms harbored. Under ordinary conditions a dose of this size is not without its dangers.

of chenopodium from the dispensers. Two weeks after they had taken the last of these two treatments, they were given a large 3-mil test dose of chenopodium. In the farm group there still remained 134 worms, or thirteen per case, after the first two $1\frac{1}{2}$ mil treatments had acted; in the city group, seven or .7 per case. There were 50 per cent of relative failures among the farm residents. The number of worms harbored by this group before treatment was undoubtedly high, however, as two controls on the same farm who, before receiving the 3-mil dose, had been treated only once with $1\frac{1}{2}$ -mils, expelled after the second treatment an average of 148 worms apiece. The results of this test would seem to show that in heavily infected districts where the average worm count is 200 or more, or where the hemoglobin of non-malarious individuals is below 60, two routine treatments of $1\frac{1}{2}$ mils each are not always sufficient and a third treatment is advisable.

c. *Experiments on typical coffee farm.* In the third experiment fifty-six persons living on a large, typical coffee plantation in the state of São Paulo, Brazil, who had already been treated twice in the routine way by campaign dispensers, were given, twelve days later, a single large dose of chenopodium. These cases were found to harbor, on the average, 5.8 worms per case after they had taken the first two treatments, while four control cases treated for the first time averaged 176 worms per case. In 41 per cent of the cases every worm was expelled by the first two treatments; in 21 per cent there was relative failure of the drug.

Interval between Treatment with Chenopodium and Re-Examination. Chenopodium has a distinctly inhibitory effect upon the egg-bearing functions of the female hookworm. If the drug fails to kill the worms, however, this effect is only temporary, and after an interval the females resume the laying of eggs. A series of test cases conducted during 1918 by a special nurse in the city hospital of São Paulo, showed that after administration of chenopodium treatment the ova disappeared from the feces and, if the cases were not cured, re-appeared the eighth to thirteenth day. This confirmed the findings of earlier investigators. Most of those who have studied the subject agree that re-examination should be made in not less than fourteen days after the vermifuge has been taken. This is the period customarily allowed in the countries where chenopodium is used.

Relative Efficacy of Chenopodium Administered in Manufactured As Compared With Freshly Filled Gelatine Capsules. The superior efficacy of freshly prepared hard gelatine capsules of chenopodium, as compared with the manufactured soft capsules which have thick, tough gelatine walls, was demonstrated by a series of test treatments conducted by the Uncinariasis Commission to the

Orient. One group of patients received manufactured chenopodium capsules in three doses of .5 mils each, at hourly intervals, with the result that only 66.4 per cent of the worms present were expelled. A second group, treated with chenopodium which had been extracted from the manufactured capsules and placed in freshly prepared capsules, also received three doses of .5 mils each. By the latter treatment 97.9 per cent of the worms harbored were expelled (Fig. 45.)

Effect of Diet on Efficiency of Chenopodium. As a rule,

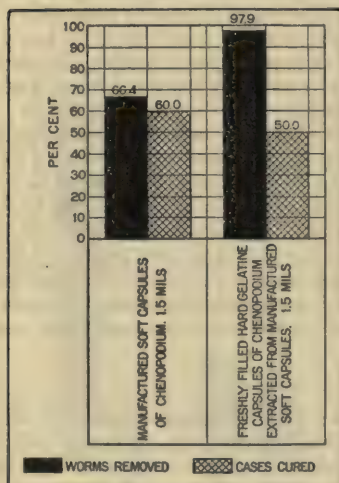


Fig. 45.—Efficacy of manufactured capsules compared with that of freshly-filled capsules as medium for administering chenopodium. Based on experiments with fourteen cases in Federated Malay States

removed by one standard treatment. Moreover, prostration was universal among patients receiving this diet, and their toxic symptoms were more severe than those manifested by any other group of patients.

In other areas of operation, also, experience has shown that a light diet on the afternoon preceding treatment is not advisable, especially in the case of persons of poor physique. In Ceylon, where the average laborer is greatly undernourished, it was found that coolies who ate an ordinary meal on the afternoon before treatment were much less apt to suffer collapse or syncope after medication than

authorities advise a very light diet during the twenty-four hours preceding the administration of chenopodium. Field experiments conducted during 1919 by the Department of Hygiene of the University of São Paulo, however, showed that when patients were allowed their usual diet on the day before treatment, but no food on the morning of treatment, by far the best results were obtained from the vermifuge. When this procedure was followed and a preliminary purge given, 87 per cent of the worms harbored were expelled by one treatment (1.5 mils); with preliminary catharsis omitted, 93.3 per cent of the worms present were expelled. When patients were allowed no solid food after 11 a. m. on the day before treatment and no nourishment of any kind after 5 p. m., and when the preliminary purge was omitted, only 75.5 per cent of all worms were

those who were limited to an afternoon meal of rice gruel. The percentage of cures was as high among patients whose afternoon meal was not restricted as among those who ate a light repast. In the Seychelles Islands, too, it was found that there was no diminution in the percentage of cures when a regular diet was permitted on the day preceding treatment. Moreover, patients were far more willing to take treatment when their diet was not restricted on the previous day.

Magnesium Sulphate the Most Satisfactory Purge for Use with Oil of Chenopodium. Although none of the purgatives which have been employed in connection with chenopodium have given entire satisfaction, magnesium sulphate has been reported upon more favorably than any of the others which have been tried. The rapidity of action of this purgative has been found to vary in inverse proportion to its concentration. Experience in Ceylon has shown that when a strong solution is administered, catharsis is often delayed until evening of the day of treatment, or even until the next morning. A weaker solution (2 pounds of salt to a gallon of water, or about $1\frac{1}{2}$ drams to the ounce) gives much prompter action and is less apt to cause griping or collapse. The most satisfactory dosage of magnesium sulphate appears to be $2\frac{1}{2}$ ounces for adult males and 2 ounces for adult females.

Omission of Preliminary Purge with Oil of Chenopodium. Most authorities hold that better results are obtained if the pre-treatment purgative is given; and in hospital practice, where the patient can rest and be under constant observation, it seems best to give it. But when it is given in field work, many of the patients, after it has acted, become weak and in some instances are unfit for work next day, with the result that they lodge complaints against the treatment. Moreover, in sparsely settled rural areas the administration of a preliminary purge is a difficult procedure and almost doubles the cost of treatment. The original experiments of Darling, Barber, and Hacker, although dealing with a number of cases too small to enable trustworthy conclusions to be drawn from them, nevertheless showed that when this purge was omitted and the other factors were kept the same as in routine treatment, two standard doses of $1\frac{1}{2}$ mls of chenopodium cured 80 per cent of the cases and removed 95 per cent of the total worms. This suggested that with an interval of twelve hours between eating and the administration of the vermifuge, the preliminary purge might be omitted.

In a series of experiments conducted in Brazil during 1919 it was found that when a preliminary purge was administered, one trial treatment consisting of $1\frac{1}{2}$ mls of oil of chenopodium given in two equal doses cured 29 per cent of the cases treated and removed 75 per cent of the total hookworms harbored. When the preliminary purge was omitted only 14 per cent of the cases treated were cured,

but 83 per cent of all hookworms were removed. The percentage of failures—cases with ten or more hookworms remaining after trial treatment—was 40.6 per cent in the case of persons receiving a preliminary purge, as compared with only 31 per cent for persons in whose treatment the preliminary purge was omitted. Thus, by all standards except that of the percentage of persons cured, the results were better when preliminary catharsis was omitted.

In a second group of experiments, in which the patients were treated with 2 mls of oil of chenopodium administered in a single dose and followed in two hours by a saline purge, it was found that in the case of those who had received a preliminary purge 12 per cent were cured by the trial treatment, 93.8 per cent of all hookworms were removed, and there were 36 per cent of failures. When the preliminary purge was omitted none of the patients treated were cured, only 87.5 per cent of all worms were removed, and there were 63.3 per cent of failures. From these findings it would seem that when the drug remains in the intestines only two hours, as is the case when it is administered in an undivided dose, a preliminary purge is necessary to aid in hookworm elimination, but when the drug is administered in divided dosage and at least a portion of it remains in the intestines for four hours, a sufficient time elapses for the drug to produce its effect, whether or not the intestines have been prepared by preliminary purgation.

In field treatments given during 1919 in Guatemala, Brazil, Ceylon, and the Seychelles Islands, preliminary purgation was omitted. No ill effects resulted in any of these areas, and there was no decrease in the percentage of cures as compared with that in other years.

Effect of Purgative on Efficiency of Remedy. Tests made in China during 1918 suggest that the rôle played by the purgative in removing the worms from the intestines, is an extremely important phase of treatment which has perhaps not been sufficiently investigated. It was noticed that the percentage of living worms expelled was increased if the salts acted quickly. This meant either that longer contact with chenopodium kills a larger percentage of worms, or that in many cases the drug temporarily loosens the hold of the worm on the intestinal wall so that a strong purgative will expel many living worms. A series of observations was then made to ascertain what effect an increase in the dose of magnesium sulphate had on the percentage of cures.

Increased Efficiency of Chenopodium with Free Purgation. The amount of chenopodium used was an undivided dose of 2 mls. At first 25 mls (1 ounce) of magnesium sulphate was administered the evening before treatment, and 50 mls two hours after the chenopodium had been taken. Of 395 infected persons treated by this method, 286, or 72.4 per cent, were found negative after one treatment. The results were so good that the amount of salts was increased to 50 mls instead of 25 on the evening before treatment,

and to 141 mils ($4\frac{2}{3}$ ounces) instead of fifty after the taking of the chenopodium. The salts given after the vermifuge were divided into two portions, one-half being administered at the end of two hours and the other half at the end of four. Of 620 persons treated in this way, 499, or 80.5 per cent, were found negative after one treatment. With the increase in the amount of salts given, there was not one case which showed any symptoms of chenopodium absorption. There were nausea and vomiting at times, but there were no ill effects due to the action of chenopodium.

CHENOPODIUM-CROTON OIL TREATMENT AS DEVELOPED IN CEYLON

In Ceylon during 1918 there was developed a special form of treatment which was used extensively during that year and in the early part of 1919. According to this treatment the preliminary purge was omitted, and a mixture of chenopodium 40 parts and croton oil 1 part was given in the standard dosage prescribed for chenopodium (see page 163), graduated according to the apparent and not the stated age of each person. The dose was usually given in two equal parts with an interval of one hour between. Two hours after the last dose of vermicide the patient received a purgative dose of magnesium sulphate.

Conditions Governing Chenopodium-Croton Oil Treatment.

All patients were kept under observation by the dispenser from the time of giving the first portion of the vermicide until the medical officer in charge was satisfied that the post-treatment purgative had acted freely. Meanwhile, the patients were allowed to rest in a sheltered place. Temporary sheltered latrines for men and women were provided near the resting place, and an apothecary or dispenser saw that the latrines were properly used. Before the patients were discharged, they were strongly counseled not to eat raw fruit or vegetables for a day or two after treatment, but to take chiefly rice and rice gruel.

Discontinuance of Chenopodium-Croton Oil Treatment in Ceylon. The chenopodium-croton oil treatment was found to have many advantages. Some of its best features were that smaller doses of salts were required to secure effective post-treatment purgation, that such after-effects as exhaustion, rheumatoid pains, and tinnitus were much less in evidence, and that in almost all cases the patients were able to work the following day. In the early part of 1919, however, a small percentage of cases treated with the chenopodium-croton oil mixture developed enteritis. In some patients dysenteric symptoms developed which required prolonged treatment. These untoward symptoms created a prejudice against the mixed treatment

which was difficult to allay, and in May it was decided to discontinue its use temporarily, substituting for it the plain chenopodium treatment.

CHENOPODIUM-CHLOROFORM TREATMENT EMPLOYED IN NICARAGUA

During 1919 a mixed treatment of chenopodium 3 parts and chloroform 1 part, by volume, was used in Nicaragua with considerable success. The mixture was given in rather large doses—3 mls the maximum adult dose—so the percentage of cures effected by two treatments was very high, much greater than with chenopodium alone. Patients treated according to this technique reported no unpleasant after-effects.

ADMINISTRATION OF CHENOPODIUM IN UNDIVIDED DOSES

In an experiment conducted by the Uncinariasis Commission to the Orient, 2 mls of chenopodium administered in two equally divided doses removed 96.2 per cent of the worms harbored by eight cases, while the same amount of the drug administered in a single massive dose expelled 95.8 per cent of the worms in twenty-five other cases. Experiments conducted by the Department of Hygiene of the University of São Paulo showed that an undivided dose of 2 mls of chenopodium, preceded by a purge, removed 93.8 per cent of all worms, whereas $1\frac{1}{2}$ mls of the drug administered in three equal doses expelled only 90.8 per cent of the worms harbored, and $1\frac{1}{2}$ mls administered in two equal doses expelled only 75 per cent of all worms. These figures suggest that it is probably unnecessary to divide the dose. Experiments to determine this point have also been made by the directors of the work in several countries.

Experience in Seychelles Islands and in Ceylon. The medical officer in charge of the work in the Seychelles Islands administered to a limited number of cases the full daily dose of chenopodium at 6:00 a. m., without preliminary purgation, but the results obtained were not so good as when the regular routine of chenopodium treatment was followed. In Ceylon, similarly, the entire amount of chenopodium in one dose was administered experimentally on a number of estates. The method is still under trial, but the directors report that it does not appear suitable for use in the presence of heavy infection.

Experience in China. The director in China, on the other hand, made extensive use of a single 2-mil dose, and in a group of experimental cases obtained satisfactory results, the percentage of cures

after one treatment being approximately 87.0. The experience in that country indicates that chenopodium in this dosage is seldom contra-indicated. Persons with active tuberculosis, moderate heart lesions, and acute bronchitis were treated and showed no ill-effects. It should be pointed out, however, that all the patients dealt with were male adults between eighteen and fifty years of age, and that the doses of salts used were larger than are customarily administered in other countries.

USE OF CHENOPODIUM IN TREATMENT OF AMEBIC DYSENTERY

In a number of countries oil of chenopodium is now being employed in the treatment of dysentery. It is reported to remove encysted ameba, to cause the disappearance of blood and mucus from the feces, and to give prompt relief to the patient.

Routine Chenopodium Treatment for Relief of Dysentery. In Siam the treatment used is as follows: 37 mls ($1\frac{1}{2}$ ounces) of magnesium sulphate are first given. Two hours later 1 mil of oil of chenopodium follows. One hour later a similar dose of the oil is administered, followed in another hour by 37 mls ($1\frac{1}{2}$ ounces) of castor oil. For more severe cases, either the preliminary purgative is omitted and 2 mls of chenopodium in 37 mls of castor oil are given in a single dose, or 1 mil of oil of chenopodium, emulsified with gum acacia, is administered by way of the rectum. In the latter mode of treatment the anal mucosa is protected by petrolatum and the injections are terminated with 50 mls (2 ounces) of an inert oil. The buttocks are elevated, and the enema—the first dose of which does not exceed 200 mls (8 ounces) for an adult—is given slowly.

EFFICACY OF BETA-NAPHTHOL IN THE TREAT- MENT OF HOOKWORM DISEASE

For several years beta-naphthol has been used to some extent in the treatment of hookworm disease. But as yet the anthelmintic efficiency and the toxic qualities of the drug have not been definitely established. Experience seems to show, however, that small doses of the drug—.5 to 1.0 grams—while very slightly toxic, have low anthelmintic power. Darling, Barber, and Hacker found that a single treatment with 40 grains of beta-naphthol removed only 26.7 per cent of the hookworms present; and Hackett in a series of experiments which included 1,114 cases discovered that two doses of the drug, each consisting of 4.5 grams, cured but 22 per cent of the cases treated.

Use of Beta-naphthol in Large Doses. Recently several studies have been made to determine the effect of beta-naphthol in larger doses. Bayma and Alves, in a series of hospital experiments in

Brazil, treated a number of cases with 18 grams of this vermifuge. The cases received a preliminary purge on the evening before treatment, and on the following day they were given 6 grams of beta-naphthol in six divided doses administered at fifteen-minute intervals. This treatment was administered on three successive days until the total dose of 18 grams had been given. A saline purge was administered on the final day of treatment, two hours after the last capsule of beta-naphthol had been taken. The treatment resulted in the cure of 85 per cent of the patients treated. Apparently no ill effects followed the large dosage.

Gonzaga and Lima slightly modified the Bayma-Alves treatment in order to make it more practical for field work on a large scale. According to their method, the preliminary purge was omitted and 6 grams of beta-naphthol were administered in one dose early in the morning. The dosage was repeated for three successive days, and a saline purge was given two hours after the last dose of the drug. Throughout the treatment patients were placed on a light diet. Of 400 severely infected cases treated by this method during 1918, as many as 73.5 per cent were reported cured.

Toxic Effect of Large Doses of Beta-naphthol. Although in the experiences of Bayma and Alves and of Gonzaga and Lima, 18-gram doses of beta-naphthol proved practically non-toxic, Smillie conducted further experiments in Brazil, during 1919, which showed that under certain conditions beta-naphthol in large doses may produce severe toxic symptoms. In the case of four patients who received 18 grams of the vermifuge, red blood cells were destroyed in great numbers, with resultant severe anemia, icterus, hemoglobinuria, and enlargement of the spleen, liver, and gall bladder. The white blood cells apparently were not destroyed by the drug. The liver, spleen, kidneys, and other organs of the body were not affected primarily, but were markedly affected secondarily, because of the anemia and the injurious effects produced by the elimination of large numbers of destroyed red blood cells. The type of case most susceptible to beta-naphthol poisoning has not been determined. In three of the severe cases of poisoning, however, there was a history of recent malaria. It may be that persons whose red blood cells have been rendered fragile by recent attacks of malaria, are more sensitive than others to the toxic action of the drug.

INTRA-INTESTINAL TUBE TREATMENT OF HOOKWORM DISEASE

A new method of treating hookworm disease, known as the intra-intestinal tube method, was devised during 1918 by Kantor, who used it with excellent results in the treatment of over 250 cases in the United States Army Hospital at Fort Oglethorpe.

This technique is based on the theory that since science has established the exact habitat of the hookworm within the human host—namely, the first portion of the jejunum, with extension along the intestine in both directions in the more severe infections—the parasites can be removed most expeditiously by a method which permits the introduction of a concentrated dose of vermifuge at the exact site of infection. The tube treatment secures this concentration, whereas when the drug is taken in capsule form, a considerable portion may be lost either by the dissolution of the capsule below the site of infection, or through the dilution of the drug by secretions if the capsules dissolve above the area of infection. Moreover, when the tube is employed the drug can be delivered in one dose, its work can be accomplished quickly, and its elimination can be promptly secured. These factors lessen the danger of cumulative toxic absorption.

Description of Intra-Intestinal Tube Technique. When this technique is employed the patient is given a light meal—chiefly rice and milk—on the evening before treatment. There is no preliminary catharsis. The next morning at about 7:30 the duodenal tube is swallowed on a fasting stomach and the patient is kept on his right side until the bucket has passed the pylorus.⁴ The exact time at which the bucket enters the intestine can be determined by aspiration. While it is in the stomach, aspiration withdraws a clear fluid, seldom bile-tinged, and generally positive to Congo paper; and if water is injected into the tube, followed by a syringe of air to clear the tube, the greater part of the water can be withdrawn by aspiration. When the bucket has entered the duodenum, aspiration withdraws golden-yellow viscid bile, negative to Congo paper. The water injected flows on into the intestines and only a small amount can be recovered.

As soon as the bucket reaches the duodenum the patient is ready to receive the drug. This is injected with a syringe (preferably of glass, and of about 30 mls capacity) and is followed by a barrel or two of air to insure the expulsion of the entire dose from the tube. The dosage of vermifuge usually employed is 3 mls of oil of chenopodium. Following the injection, a period of six minutes is allowed for the diffusion of the oil throughout the worm-infested region. At the expiration of this time 2 to 3 ounces of a warmed saturated solution of magnesium sulphate are given transduodenally to remove the drug quickly from the very highly absorptive small intestine. Within half an hour the majority of patients have a copious watery stool containing oil and sometimes worms. This flush method of controlling the drug permits its use in doses ordinarily considered dangerous.

⁴ With the buckets (Einhorn, Rehfuß) used by Kantor, this usually took place within three hours. The tube used by Jutte is said to pass the pylorus more quickly

After the salts are given, the tube is removed and the treatment is complete. In most cases from three to five stools follow the first. If a sufficient number do not result, further catharsis may be administered by mouth. The patient is generally sick during the day of treatment, but by 5:00 p. m. he is ready for a light meal, and usually he has made a complete recovery by the next morning.

MANNER OF DETERMINING RELATIVE EFFICIENCY OF DRUGS

The proportion of infected persons cured by two treatments does not always convey an adequate idea of how efficient a remedy is. Two treatments of a powerful vermicide may remove from a large

CASE NO	WORMS HARBORED	WORMS REMOVED BY TWO TREATMENTS	PERCENTAGE OF WORMS REMOVED BY TWO TREATMENTS
1	64	48	75.0
2	195	193	99.0
3	873	461	52.8
4	1227	498	73.2
5	439	439	100.0
6	93	27	29.0
7	291	120	41.2
8	686	678	98.8
TOTAL	3868	2864	74.0
Percentage of Worms Removed from Group-----			$\frac{2864}{3868} = 74.0$
Average Percentage of Worms Removed from Each Individual *			$\frac{569.0}{8} = 71.1$
Knowlton's Index of Efficiency-----			$\frac{74.0+71.1}{2} = 72.6$
* Addition of Figures in column headed Percentage of Worms Removed by Two Treatments, divided by the number of cases treated.			

Fig. 46.—Method of computing Knowlton's index of efficiency

proportion of cases all but 2 or 3 per cent of the worms they harbor, and still fail to effect the complete cure of any considerable number of the patients. Thus, in a series of experimental cases, two treatments of chenopodium, each consisting of 1½ mls, have expelled more than 95 per cent of the hookworms harbored and yet cured only from 40 to 50 per cent of the cases. To effect the complete cure of all infected persons required, on the average, four treatments of the drug. This meant that the additional two treatments were used to expel less than 5 per cent of the worms originally harbored.

Efficiency As Estimated by Percentage of Worms Removed. For judging the efficacy of a drug the percentage of worms expelled is a better criterion than the percentage of cures obtained. It affords

a satisfactory measure of efficiency in districts where there is moderate or severe infection distributed with a fair degree of uniformity among various classes of the population. But where the infection is mild and there are a few carriers with a disproportionately large number of worms to dominate the results, its value is not so great. One of the chief advantages of the worm-count method lies in the fact that the worm-count is a positive finding, all errors tending to decrease the apparent efficiency of the drug; while in estimating efficiency by cures all errors of omission, due to faults inherent in the methods of diagnosis followed, tend to enhance the apparent value of the remedy by fictitiously increasing the number of cases registered as cured.

Knowlton's Method of Determining Efficiency. By adding the percentages of worms removed from each member of a group of infected individuals, and dividing the total of these percentages by the number of individuals comprising the group, a fairly good index can be obtained. This method is open to the objection, however, that the case with one worm will count for as much as the one with a thousand. Knowlton therefore recommends combining this method with the one whereby efficiency is determined on the basis of the percentage of worms removed from the group. The two percentage figures thus derived are averaged, and a figure is obtained that is believed to give the most satisfactory index of efficiency of any method yet evolved. Figure 46, page 174, illustrates this method of obtaining the efficiency index, as applied to a supposititious group of eight cases.

V

HOOKWORM INFECTION SURVEYS

The Board's participation in measures against hookworm disease in any state or country is contingent upon official invitation from Government. As a preliminary step to the arrangement of a definite program, it is customary to make an infection survey of the territory. This survey defines the geographical prevalence and distribution of the disease and the practicability of its control, makes available data concerning the insanitary conditions which are responsible for the presence and spread of the infection, and furnishes information relative to the public health or other agencies through which systematic efforts against the disease can be begun with greatest promise of success. Thus the survey gives to Government and to the Board definite information upon which a satisfactory working agreement can be based. This information is also of much assistance when the measures designed to reduce the incidence and severity of the disease are put into operation.

Infection Surveys Conducted or Authorized. During 1919, infection surveys were undertaken and completed in the states of Paraná and Minas Geraes, Brazil; and other surveys were begun, but not completed by the end of the year, in the states of Maranhão, Santa Catharina, and Bahia, Brazil; in Porto Rico; and in Colombia, South America. Surveys were authorized, but not begun during the year, in Mauritius, Borneo, and the presidency of Madras, in India. At the completion of the surveys of Paraná and Minas Geraes, these states entered upon co-operative programs for the control of hookworm disease.

INFECTION SURVEY OF PARANÁ

An infection survey of the state of Paraná, Brazil, was made between August 4 and October 31, 1919. Approximately 1 per cent of the population of the state was examined in ten different survey centers, which were chosen as representing the three typical divisions of the state—the agricultural lowlands, the somewhat higher but heavily wooded and well-watered timberlands, and the cool, cattle-raising uplands. Groups examined were representative of urban and rural populations, of various occupations, of all age and social groups, and of all types of physical condition.

Rate of Hookworm Infection in Paraná. The average rate of infection for the entire state was found to be 31.9 per cent. In the lowlands the rate reached 77.5 per cent; in the higher forest region it was only 25.6; and in the prairie uplands it was 11.1. Of the rural

population examined 45.6 per cent were infected, as compared with 25.9 per cent among town and city inhabitants. A summary of the occupational incidence of infection showed the highest rate—41.2 per cent—among agricultural laborers. Factory workers came next with an infection rate of 35.8. As is usually the case, the conditions surrounding wealth and education gave relative protection against infection, but that the protection afforded was not absolute is evidenced by the infection rate of 13.6 per cent which obtained among professional men and estate proprietors. About half of the persons examined claimed to use latrines. The infection rate obtaining among these persons was 22.1 per cent, as against 39.1 per cent among those who had no latrine accommodations.



Fig. 47.—Hookworm infection map, state of Paraná, Brazil

Severity of Hookworm Infection in Paraná. Hemoglobin tests of over 4,000 persons showed the relative gravity of the infection in this state. Persons infected with hookworm disease and giving evidence or history of malaria, had a hemoglobin average of 65.5 per cent, while those having hookworm infection but giving no evidence or history of malaria showed a hemoglobin average of 67.8 per cent. Although the incidence of hookworm infection in the state of Paraná as a whole is light in comparison with that in other Brazilian states, it nevertheless constitutes a most serious drain on the health and working capacity of a large number of inhabitants.

SURVEY FINDINGS IN MINAS GERAES

On June 29, 1919, an infection survey was undertaken in the state of Minas Geraes, Brazil. Examinations were made in twenty communities selected as representative centers of the two main divisions

of the state—the prairie region, where the soil is sandy; and the fertile wooded region, with its subsoil of clay loam. In all, 8,499 persons were examined. Of these, 72.3 per cent were found to be infected with hookworm disease. The average rate of infection in the prairie section was 66 per cent, as compared with 90 per cent in the fertile wooded area. Hemoglobin averages, which varied from 73.8 in the region of lightest infection to 57.3 in the most heavily infected area, indicated that the degree of infection prevailing throughout the state was relatively high. Latrines are little used except in certain of the more progressive cities. Of the 8,499 persons examined, only 637 stated that they used latrines. The greater number of the persons who used latrines lived in suburbs of the cities, where there are more



Fig. 48.—Distribution of hookworm disease in state of Minas Geraes, Brazil

or less complete sewerage systems. The people proved very amenable to suggestions regarding sanitary improvements, and a systematic educational campaign should be productive of wide-spread reform.

PREVALENCE OF HOOKWORM INFECTION IN PORTO RICO

As early as 1904, measures to control hookworm disease were inaugurated in Porto Rico by Ashford, King, and Guiteras; from that time on, the work has been continued with more or less regularity. Most of this work was of the dispensary type. Extensive measures for the control of soil pollution were not carried into effect. At the end of fifteen years the infection rate on the island remains well over 80 per cent. In the rural districts of the island fully three-

fourths of the homes are without latrine accommodations. Of the existing latrines, not one in one hundred is sanitary. Considerable soil pollution exists even in towns that have sewerage systems. Late in 1919 the Health Commissioner of the island invited the International Health Board to send a representative to Porto Rico for the purpose of ascertaining the present rate of hookworm infection. In response to this request an infection survey was inaugurated toward the close of the year.

Findings of the Porto Rico Survey. Ten representative areas were chosen for survey work, and 2,000 examinations were set as a sufficient number to give a fair index of the prevailing rate of infection. Each district was allotted a share of these examinations proportionate to the total number of its inhabitants. In consequence, examinations were representative of all types of the population. Results of microscopic examinations showed that except in urban centers, the incidence of hookworm infection was extremely high. The average rate of infection in the ten areas was 82.6 per cent. In certain coffee and sugar districts the percentage of infection reached 100. As determined by hemoglobin index and worm counts, infection was found to be not only high but severe. The hemoglobin average among infected persons was only 64.1 per cent. The co-operation of Government and of the people throughout the survey was all that could have been desired. There is every prospect that an energetic control program, which stresses latrine building and other proper preventive precautions, will produce excellent results in bringing about a reduction in the prevalence of the disease.

INFECTION SURVEY BASED ON WORM COUNTS

A new type of infection survey, with worm counts as its central feature, was developed by the Board's Uncinariasis Commission to the Orient. This method was employed in carrying out the survey of Java in 1916 and has since come into extensive use in Brazil. The customary microscopic examination of fecal specimens is dispensed with, and the counting of worms expelled as the result of treatment by representative groups of persons is substituted.

Methods of Conducting Worm-Count Survey. The patients to be treated are carefully selected from the different localities to be included in the survey. Effort is made at all times to secure groups whose state of health closely approximates the average for their communities. Not less than twenty-five nor more than thirty persons are usually chosen for each locality, adults comprising two-thirds of the group. Different activities and occupations find proportionate representation, and the number of males and females—of boys and girls as well as of men and women—is equalized wherever possible. The persons to be examined are treated with a vermifuge, and all stools which they pass for three days are retained, washed,

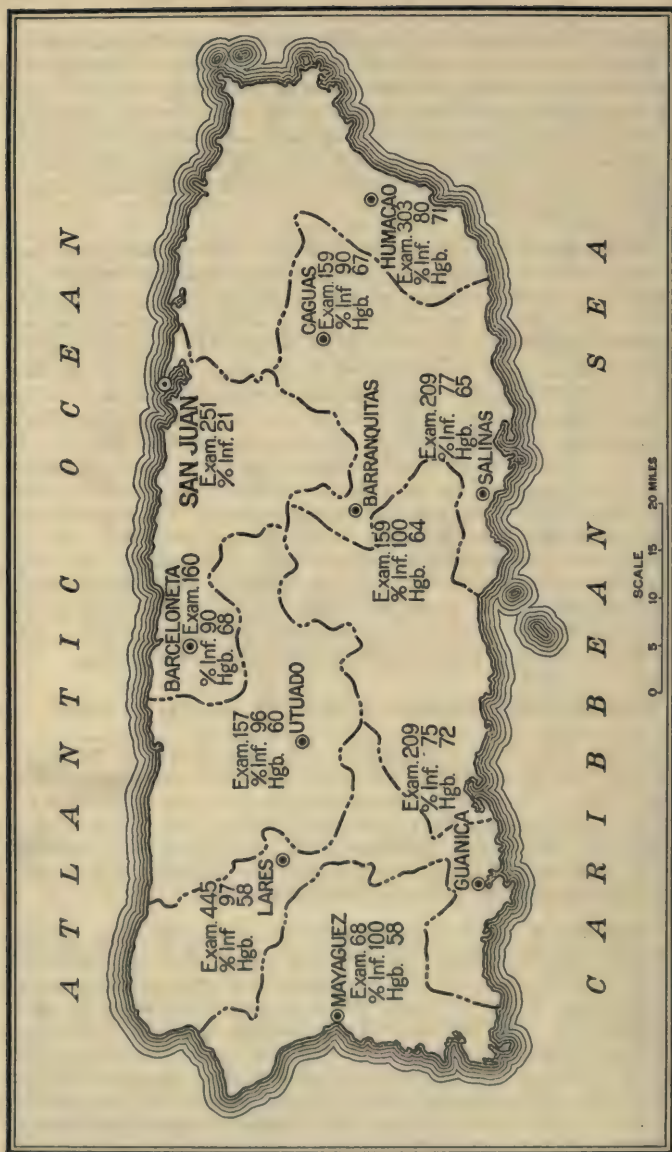


Fig. 49.—Hookworm infection survey map of Porto Rico

and searched for worms. The worms passed by each person are then counted and identified as to species. Treatment is usually repeated at ten-day intervals until three treatments in all have been taken.

Advantages of New Type of Survey. The principal advantage of this method of conducting a survey lies in the fact that it yields more accurate information as to the severity of the infection than does the ordinary microscopic search for eggs in the feces. It is especially valuable for determining not only the extent but the severity of hookworm infection in different localities, and the relation of occupation, age, and other factors to the number of worms harbored. By thus indicating more accurately the relative severity of the infection in different localities and among different groups, it enables control measures to be undertaken with greater assurance that the disease is being attacked first in those areas where it assumes its most serious aspect.

VI

HOOKWORM CONTROL OPERATIONS

Nothing could be simpler in theory than the few measures necessary for the control of hookworm infection. The cycle of the worm from the moment the egg is deposited on the ground until it has reached the small intestine of its human host and developed to its adult stage, is well understood, as are also the details of its life-story and environment. In addition, there are at least two drugs which are most potent in freeing the human system of the parasites. It should therefore be comparatively simple to cure those who have the disease, to prevent others from contracting it, and thus to bring about, within limited areas at least, its complete eradication.

Complete Control Never Accomplished. Although the problem of complete eradication is simple when stated on paper, it is not so in practice. The Board has been engaged in work against hookworm disease since 1910, similar work was undertaken in Porto Rico in 1904, and the attack on the disease in the mines of Belgium, Holland, and Germany began as early as 1902; yet it is impossible to point to any one mine or area from which the infection has been completely eradicated. In the mines of Germany it was reduced from 16.8 per cent in 1903 to .18 per cent in 1912; in those of the Netherlands, from 25 per cent in 1903 to .32 per cent in 1913; and in those of the Liege district of Belgium, from 22.8 per cent in 1902 to 1.2 per cent in 1913. These are the nearest recorded approaches to complete control.

Difficulty of Completely Eradicating the Infection. Many obstacles stand in the way of complete eradication, even in isolated areas having no immigration and with natural conditions that either limit or preclude intercourse with the outside world. It is seldom possible to examine every individual in an area or to treat until cured all who are found infected; when latrines of a proper type are installed in sufficient numbers to prevent soil pollution, it is still necessary to accustom the people to their use—and this is a task that usually requires a long period of education and enlightenment; and even when both the foregoing conditions are fulfilled, there still remains for a time the danger of re-infection from hookworm larvae already in the soil.

RE-INFECTION IN TREATED AREAS

The failure to achieve complete control of the infection in any area is probably due in the main to three reasons: first, that in most of the areas of operation effective excrement disposal has not preceded the curative work by an interval of sufficient length to insure a sterile

soil; second, that there has been an error of greater or less degree in microscopic diagnosis; and, third, that there is at present a lack of data on certain points concerning which definite knowledge is essential for control. In six countries during the period under review, a large number of persons who had previously been treated and presumably cured were re-examined in order to ascertain whether infection was recurring in the areas in which they lived, and if so to what extent.

Re-infection in Salvador. In only one instance in which re-examination was made was there found to be an absence of re-infection. This was at an orphanage in San Salvador where among twenty-three children cured of hookworm disease three years previously, there was no evidence of a recurrence of the infection—a result doubtless due to the excellent sanitary conditions prevailing at the institution. In the town of Apopa, Salvador, however, where there are few latrines, an infection rate of 77.3 per cent was found among eighty-four persons cured three years earlier.

Low Rate of Re-infection on Costa Rican Plantations.

With the exception of the orphanage in San Salvador, the lowest re-infection percentages recorded were in Costa Rica, where on Aquiares estate only 4.0 per cent infection was found on re-examination of 223 laborers who had been cured eighteen months earlier. On another estate in this country—Rodeo—a rate of 14.4 per cent was found among 191 persons who had been cured from five to eighteen months earlier. On neither estate was every home provided with a latrine: Aquiares had provided but half and Rodeo but one-fourth its homes with this convenience at the close of the curative campaign.

In the canton of Bagaces, where at the time of the inauguration of control measures an infection rate of 72.1 per cent obtained, re-examination in 1919 of forty-four school children who had been cured three years earlier showed an infection percentage of only 2.3. At the time of re-survey 82 per cent of the homes in this canton were provided

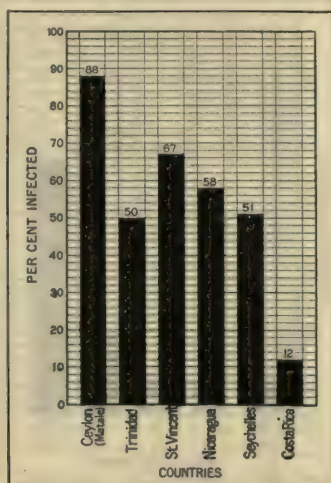


Fig. 50.—Re-infection rates among persons previously treated for hookworm disease, by countries. Interval of twelve or more months between treatment and re-examination

with latrines. In the canton of Liberia, where the original rate of infection was also very high, re-examination showed only 18 per cent infection among 238 soldiers who had been cured three years previously. The low re-infection rates for Costa Rica, however, are in striking contrast to the rates reported for areas in other countries where similar re-examinations were made.

Re-examination of Treated Patients in Trinidad. In Trinidad, where the Ancylostomiasis Commission has been at work for more than five years, where over \$75,000 has been spent on the

work of hookworm control, and where 35,000 persons have received the benefit of treatment, investigation was undertaken during 1919 to determine what proportion of the people who had been pronounced cured in the course of the control campaign had become re-infected. Sixteen districts in which treatment had been given from nine to twenty-nine months previously, were selected for re-survey. These districts were representative of the entire area in type of population and range of sanitary conditions. Conclusions drawn from the re-survey findings can therefore be safely applied to the whole region in which operations were carried out. Re-examination of 1,721 inhabitants of these districts, all of whom had been cured in the original campaign, showed that over 50 per cent had become re-infected.

The rates of re-infection ranged

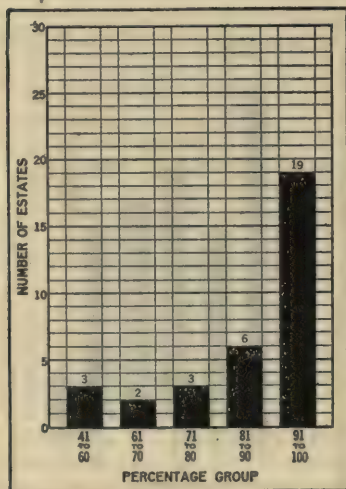


Fig. 51.—Re-infection rates at end of one year or more. Thirty-three treated estates of Matale area, Ceylon. Persons examined, approximately 3,000

in the several districts from 18 to 87 per cent. They varied with the degree of sanitary improvement that obtained in the area. Poorly sanitated areas invariably had more than 60 per cent re-infection, and even those in good sanitary condition had relatively high rates of re-infection if poorly sanitated districts surrounded them. (See Fig. 14, page 101.)

Re-infection Rates in Nicaragua and the Seychelles. The director for Nicaragua states that at the end of eighteen months there was a re-infection rate of 57.9 per cent in the town of Nandasmo, where every home had been provided with an approved

latrine during the progress of the curative campaign. Re-surveys, however, revealed the fact that not more than half of these latrines had been used with any degree of regularity. In the Seychelles Islands, among 4,927 persons known to have been cured a year or more prior to their re-examination in 1919, an infection rate of 51 per cent is reported, and this despite the fact that practically every home on the islands is now supplied with some kind of latrine and there is little evidence of soil pollution.

High Re-infection Rates on Estates in Ceylon. It is from Ceylon, however, that the highest rates of re-infection have been reported. On the thirty-three estates of the Matale area whose laboring force was partially re-examined during 1918, after the lapse of at least a year, the average percentage of re-infection was 88 among a total of approximately 3,000 persons examined. The rate ranged from as low as 45 per cent on one estate to as high as 100 per cent on ten. Nineteen of the estates had re-infection percentages between 91 and 100; six between 81 and 90; three between 71 and 80; and only five less than 70. On thirty-eight estates of this area where re-examinations were made during 1919, re-infection rates varied, among persons cured twenty-two months earlier, from 40 to 91 per cent.

In the Bogawantalawa and Dickoya areas—the two other estate areas completed at practically the same time as Matale—systematic re-examinations have not yet been made on a large number of estates, but the information received from Bogawantalawa shows that on the three estates for which reports have been received, the re-infection rates at the end of twelve months or more were 70, 88, and 100 per cent.

Re-examinations on Ceylon Estates Completed During 1918. A limited number of re-examinations were made in those estate areas of Ceylon in which operations were terminated during 1918. Three months after completion of work on the estates in the Upper Maskeliya area, specimens from 348 laborers who had been reported

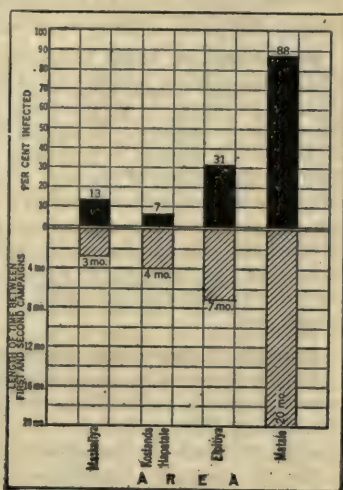


Fig. 52.—Re-infection rates in Ceylon. Relationship between length of time elapsing between treatment and re-examination, and rates of infection recorded

cured, were re-examined and 13 per cent were found to be infected. On nine estates in the Elpitiya area a small proportion of the inhabitants were re-examined from six to eight months after the close of the campaign. Here the infection percentages ranged from 6 to 47, the average being 31. In the Koslanda-Haputale area, among seven estates a number of whose residents were re-examined at the end of four months, the rates ran from 2 to 31 per cent, the average being only 7 per cent. It should be pointed out, however, that in the case of all three of the estate areas last mentioned, the re-examinations were made too soon after the completion of the original campaign. It is to be expected that other re-examinations which will follow at the end of twelve months or more will establish re-infection percentages more closely approaching those recorded for Matale and Bogawantalawa.

Reduction of Mass Infection First Essential to Control. These high rates of re-infection should not be accepted as indicating that no considerable progress has been made toward bringing the disease under control. It should be remembered that the problem of hookworm control is primarily one of reducing mass infection. The practical phase of the task is concerned with the removal of the largest possible number of worms from the largest possible number of infected persons. Upon this basis the best criterion for judging the effectiveness of a curative campaign in any area is not the percentage of infected persons who are cured or who remain cured, but the proportion, expelled and destroyed, of the total worms harbored by the population.

Factors Determining Percentages of Re-infection. Even though in certain of the areas mentioned, from 50 to 100 per cent of the persons formerly cured of the disease have since become re-infected, there can be little doubt that as a result of treatment the average number of worms harbored by each infected person has been very materially reduced. Conditions extremely favorable for the prevalence and persistence of the infection exist practically throughout all countries in which the work has been conducted; there is at present lack of definite knowledge as to how long larvae remain infective in the soil; the latrine accommodations provided in many areas have been defective or inadequate, the habits of the people grossly unsanitary, and in addition war conditions have interfered seriously with due and effective sanitary supervision and reasonable regimentation. Under these circumstances re-infection was bound to occur in greater or less degree, but it will unquestionably diminish as effective sanitation is introduced and the curative measures are extended.

NEED OF SCIENTIFIC KNOWLEDGE ON FACTS ESSENTIAL FOR CONTROL

The fact that after a series of efforts at control in different parts of the globe, extending over a period of more than fifteen years, it is still

impossible to point to any single area from which the disease has been completely eradicated, suggests that perhaps the work is being carried out with a lack of scientific information on certain points concerning which definite knowledge is indispensable if complete control is to be achieved. It is hoped that a series of studies can soon be made which will supply definite experimental proof on those phases of hookworm control that still require further investigation.

Viability of Hookworm Larvae in Soil and Feces. One of the most important factors calling for further study is that relating to the viability of hookworm larvae in soil and feces. In the past it has been commonly supposed that after a period of from six to ten months the soil would become sterile and the disease would gradually die out, but the evidence now at hand seems to indicate that soil once heavily infected—particularly in tropical countries, where the temperature seldom or never drops to the freezing point—must remain infected for a considerable time even after sanitary conditions have been improved. Thus, Kofoed has recently reported that in the soil of California the larvae remained alive for sixteen months, and it is probable that in more tropical climates they persist for even longer periods.

a. Life of larvae in garden soil of China. There was opportunity for limited investigation of this question in China during 1918. In that country much of the soil is under cultivation the year round, assisted by intensive fertilization with human excreta. In the middle of August, 1918, a plot of land in which no larvae could be demonstrated was fenced off. This plot was then divided into three sections. In (A) the ground was dug up in the manner adopted in planting a Chinese vegetable garden, and feces that were known to contain hookworm eggs and larvae were mixed with the soil. In (B) infected feces were merely sprinkled over the top. In (C) the ground was left undisturbed and uncontaminated. The plot of ground selected for the experiment was 1,000 feet above sea level and during the period of five months that had elapsed up to December 31, 1918, had been subjected to temperatures varying from 38° C. to -4° C. (100° F. to 25° F.). The soil in the meantime had been directly exposed to the summer sun as well as to ice and snow.

For the entire five months' period, plot (C) gave negative results. On the other hand, until December, when the cold weather set in, larvae could always be found in (A) and (B) on the first slide examined. Afterwards it was necessary to pour water on the culture to draw the larvae out, and the last time the test was made three slides had to be prepared before a larva was found. The larvae were always actively motile in (A) and (B), and in December were still present in enormous numbers.

In other experiments, conducted during the month of September and again at the end of December, fifteen fields were indiscriminately chosen and samples of soil were obtained and cultivated. All were positive for hookworm larvae.

b. Investigation of larvae viability in storage pits. It is customary for Chinese farmers to store excreta in storage pits after purchasing it for use as fertilizer. An investigation was made during 1918 to determine the probable duration of life of hookworm ova and larvae in these pits. For economical reasons none of the farms visited had feces that had been in storage for more than two and one-half months, despite the fact that the farmers claim that the older the excreta the more valuable it is for fertilizing purposes. On one occasion thirteen pits were visited and on another twelve, and samples of feces were obtained from all. The age of the feces from which the samples were taken ranged from three to seventy-two days. All specimens contained both hookworm and ascaris ova, but larvae were not numerous except on cultivation.

c. Penetration of larvae through sand. Dr. Dershimer investigated this question in connection with his work at the Onderneeming Industrial School in British Guiana. In spite of the fact that pail latrines had been in use in this institution for some time, an unusually high percentage (95.8) of the 142 boys living there were found infected. On investigation it was discovered that the contents of the latrines were buried around lime trees to fertilize them, and that a large proportion of the boys who worked round these trees when the ground was wet subsequently developed ground-itch. A pound or more of sand taken from the surface near the trees was examined microscopically and numerous larvae were discovered. All had worked through two feet or more of sand to gain the surface.

Viability of Hookworm Larvae in Water. Although oxygen is necessary to the development of hookworm ova, and both oxygen and food are required by the young larvae, adult larvae need no food and can survive for a long period in atmospheres completely devoid of oxygen. In fact it has been noted that at this stage of development larvae exhibit a marked preference for a water habitat. Adult larvae observed by Looss remained alive in water for more than 300 days. This prolonged viability of larvae in water would account for the high rate of hookworm infection which obtains among laborers in rice fields.

Transmission of Infection by Flies and Dust. Some data from Arkansas and Texas brought together by means of the laboratory car *Melchnikoff*, during the treatment of infected soldiers in the Southern States, suggest that there is a possibility of the infection being transmitted by dust. This subject is worthy of further study. The role played by insects, particularly flies, in transmitting the infection, also remains to be thoroughly investigated. Miyagawa, in a series of investigations conducted in Japan, found that the water washed from maggots secured in and around latrines yielded, upon centrifugation, several hookworm eggs. The problem of fly transmission was studied to a limited extent in China during 1918. On two occasions several hundred flies of the "blue-bottle" species were

taken from several native latrines. Those from each latrine were placed in separate bottles and thoroughly washed. The water was then centrifuged and microscopic examinations were made. All the specimens gathered from the seven latrines visited on the first occasion showed ascaris and one showed hookworm ova, while those from all five latrines visited on the second occasion again showed ascaris and one showed hookworm ova. The water in which the flies were washed was then cultured by the charcoal method, but no additional hookworm larvae were demonstrated. No explanation can be offered as to why the eggs of one parasite should be found more frequently than those of another, as the percentage of the population infected with both parasites is about the same. The terminating of the fly season prevented further investigation being made of this interesting subject.

MODIFIED WORKING METHODS TO REDUCE MASS INFECTION

It has long been evident that if treatment is to be extended to the hundreds of millions of East Indians, Egyptians, and Chinese, to say nothing of the dense masses of humanity inhabiting other tropical and sub-tropical lands, a means must be found of lowering the cost of the work without seriously impairing its efficiency. The great bulk of the people in these lands are agriculturists, and practically 100 per cent of the adolescents and adults among them are infected. Two means exist of making treatment more readily available for them: (1) preliminary microscopic examination can be omitted in regions of heavy infection, and the time and personnel now employed in this phase of activity can be utilized for actual curative or preventive work; and (2) since it seems neither necessary nor feasible to attempt the immediate removal of the very last hookworm which these persons harbor, a quickly efficient and reliable method of treatment can be developed which can be administered as a routine, with the expectation that effective sanitation and post-campaign treatment will eliminate whatever light infection remains.

Impracticability of Insisting Upon Absolute Cure. Large numbers of worm counts conducted by the Department of Hygiene of the University of São Paulo have shown that two standard treatments (1½ mls each) of oil of chenopodium remove an average of 95 per cent of the hookworms harbored by an individual, and that three treatments remove an average of 98 to 99 per cent of all worms. To strive for the absolute cure of each infected person—i. e., the removal of the very last worm—often involves a long series of treatments and re-examinations, and besides is in certain other respects an impracticable standard. In present practice by this plan it is not usual for all worms to be expelled. Instead, they are reduced to a

minimum. When microscopic examination aided by the centrifuge is the method of diagnosis employed, there is a material error in first examinations as well as in re-examinations after treatment has been taken—an error which may be conservatively estimated as exceeding 15 per cent. Thus there is considerable unreliability in the very standard upon which cure is based. Then, too, infected cases not detected by the present method of diagnosis not only are given no opportunity to receive treatment for hookworm or for other parasites, but these, as well as the cases inaccurately pronounced cured after treatment, are given the impression that they are free and as a result they continue to spread the disease. There are, moreover, large numbers of persons who cannot be cured, because of refusal to take treatment or for medical or other reasons. This group commonly represents about 20 per cent of those infected. While striving for cures in four-fifths of the infected population, this group escapes and continues to seed its environment.

Mass Treatment Without Preliminary Diagnosis by Microscope. After all, it is not the few worms left after treatment, but the average of 150 or more worms harbored by the great mass of infected and untreated humanity in tropical and sub-tropical lands, that is the important factor in hookworm control. Communities in which the adults have an average of fifty or fewer worms obviously do not require treatment so urgently as more heavily infected localities. Where there is a high rate of infection and the average number of worms per person exceeds fifty, it would seem that the people might be treated *en masse* without preliminary microscopic examination, every person in the group except the very young and very old receiving a routine treatment. Even though in a few instances more than 10 per cent of the worms remained after treatment, this would be offset by the error in microscopic diagnosis under the present plan of work. Therefore, though the modified plan, when considered theoretically, may appear to lack a certain degree of thoroughness, in actual operations by this plan it would seem that but little thoroughness should be lost.

Experimental Plan of Control for Ceylon Estates. Ceylon was the first country in which the modified intensive plan of control was attempted. More than 99 per cent of the Tamil laboring population of this country is infected with hookworm disease. Preliminary fecal examination was therefore omitted in the case of all except 10 or 20 per cent of the laborers on each estate. If the specimens obtained showed over 80 per cent infection, the whole labor force, except persons less than a year old, those physically unfit for treatment, and pregnant women beyond the third month, were given one or two medium doses of chenopodium with an interval of one week between. All were examined clinically to find whether they were fit to take treatment and also to impress them with the scientific soundness and value of the work. Ten days after the first or second treatment,



Fig. 53.—Medical director examining patients to determine their fitness for receiving hookworm treatment. Ceylon



Fig. 54.—Education is one of the most important features of the world-wide campaign against hookworm disease. Two groups assembled in Costa Rica to hear a lecture on the disease. Above, conference at La Unión, province of Cartago; below, conference at Heredia, province of Heredia

fecal specimens were obtained from all those who had been treated, and as a rule it was found that about 70 per cent of those who had had two treatments had been cured. Persons found positive after two treatments were given a third treatment.

Modification of Intensive Plan Tentatively Adopted for Brazil. In Brazil, too, where more than ten million people, scattered over a vast and sparsely settled area, are awaiting treatment, similar effort is being made to accelerate the rate of treatment by conservative modification of the plan originally followed. In certain of the posts in this country it is now customary to take a census that includes every individual and to examine all once, and once only, microscopically. Every individual found infected with hookworm disease is treated twice with oil of chenopodium, with an interval of ten days between treatments. Individuals with hemoglobin below 50 per cent are treated three times without additional microscopic examination, unless malaria is a controlling factor in the anemia. In addition, all persons suffering from any form of intestinal helminthiasis whatever are treated once, as well as all the members of any family which contains even one infected individual. It is believed that this plan of work will reach all infected persons and succeed in eliminating at least 95 per cent of the intestinal parasites they harbor. If at the same time the construction of latrines at all the homes is secured, the community will be permanently protected and the remaining worms will probably disappear. Summed up in a few words the system means: a latrine at every house, education sufficient to insure its proper use, and every infected individual treated at least twice.

Study of Relative Efficiency of Regular and Modified Intensive Plans. The Board is not yet prepared to commit itself definitely to the new plan of work. Before doing this it will have to test, under a wide variety of conditions and in a number of different fields, the relative merits of the regular and the modified intensive plans of work. An initial step in this direction was taken in São Paulo, Brazil, during 1918 and 1919. In one of the two posts maintained by the Board in this state, the standard was set of treating every infected individual to a cure as determined by microscopic re-examination. In the other post, every infected individual was given one microscopic examination and two treatments of chenopodium. In the case of persons with hemoglobin below 65 per cent, three treatments were administered. The conditions of race, infection, and laboratory efficiency were practically the same for both posts. At the first post, in sixteen months, 9,393 persons were treated (587 persons per month) at a per capita cost of \$3.05. At the second post, in 7½ months, 6,720 persons were treated (900 per month) at a cost of \$1.97 per person. From these results it is evident that the modified method insures a great saving of time and expense.

POST-CAMPAIGN MEASURES ON CEYLON ESTATES

Arrangements by which post-campaign measures will be conducted on all estates on which the regular work of treatment has been completed, were made with Government and with the planters of Ceylon during 1917. It is planned to have these measures continue for a period of eighteen months following the close of the initial demonstration in the different estate areas. They will be under the supervision of government medical officers, assisted by microscopist-dispensers trained in regular campaign work. At the end of the eighteen months' period of organized post-campaign measures, the estate dispensers will be expected to handle the situation, which will consist mainly in the treatment of small groups of new laborers coming to the estates from time to time.

Extent of Post-campaign Work to End of 1919. During 1918 and 1919, post-campaign measures were conducted on the estates in the Matale area where the original treatment had been completed during 1917. By the end of 1919 more than 8,000 laborers had received post-campaign treatment. It is significant of the increasing interest in anti-hookworm work in Ceylon that two districts in which campaigns were conducted during 1919 asked that post-campaign measures be carried out in these areas.

Methods Followed in Post-campaign Work in Ceylon. In carrying out the post-campaign work in Ceylon, the plan followed during 1918 and 1919 was to take a complete census of each estate and to distribute tins for excreta to at least fifty coolies taken indiscriminately from among men, women, and children who had been treated in the original demonstration campaign. Examination of the excreta served to indicate roughly what percentage of re-infection had occurred. The medical officer clinically examined every person and prescribed for those who were to be treated. Two treatments, separated by an interval of ten days, were administered, and then the staff left the estate.

Proposed Modification of Post-campaign Methods. In future work it is proposed to modify the plan in the case of those estates on which, after careful survey of the latrines and of a zone within a radius of seventy-five yards around each of the lines or groups of lines, the post-campaign medical officer finds that the latrines are in general use and are being properly kept, and that the zones around the lines are free, and are being kept free, from visible soil pollution. On such estates a third treatment is to be given to all found to be still positive on microscopic examination after the second treatment. This will complete the work on such estates if arrangements are made for the treatment of all new coolies immediately upon their arrival. On all other estates, additional treatments, after the first series, are to be deferred until eighteen months after the close of the original demonstration campaign, by which time specific soil pollution should be controlled.

RE-CAMPAIGN FOR COMPLETELY ERADICATING HOOKWORM DISEASE FROM THE SEYCHELLES ISLANDS

Because of the loyal co-operation which Government and the people of the Seychelles Islands have accorded the work of hookworm control, and also because of the isolation of the islands and their small population, it is believed that this field offers most favorable conditions for the complete eradication of hookworm disease. It was therefore determined that upon completion of the first campaign in the Islands, a re-campaign for the extermination of the disease would be attempted. This second campaign began on June 1, 1919, after control operations had been extended to all of the Seychelles with the exception of the small islands which lie some hundreds of miles from the main group. The second campaign began in the South Mahe area, where the first had been conducted two years before. In August similar measures were undertaken in Central Mahe. By the end of the year 8,964 persons had received post-campaign treatment.

Re-campaign Methods in the Seychelles. The plan adopted in re-campaign work in the Seychelles Islands calls for a census of the entire population, the microscopic examination of all inhabitants for the presence of hookworm infection, and the treatment of all infected persons until microscopic re-examination indicates that they have been cured. Re-examinations are made seven days after treatment; first re-examinations are made after second treatments, and thereafter re-examination follows each treatment. About two months prior to the inauguration of post-campaign measures, government sanitary inspectors visit each home and prosecute all persons whose latrines are not in satisfactory condition.

CO-OPERATION OF NUMEROUS AGENCIES NECESSARY TO CONTROL HOOKWORM INFECTION

Efforts toward the control of hookworm disease are slowly progressing throughout the vast regions of infection. At the rate at which the campaign is marching, however, many years will be required to rid the world of the disease, and enormous rural populations will wait in vain for relief from a great scourge, unless numbers of auxiliary agencies can be organized to assume the burden of systematic and permanent control measures in the various infected areas. Some progress has already been made in this direction, and although these efforts are as yet sporadic and unorganized, they are hopeful signs of an onward movement.

Student and Army Forces as Propagandists. The schools, colleges, and army camps of a country are valuable sources from which the gospel of sanitation and curative work may be spread abroad among the population, and for this reason attention is being

concentrated more and more upon the work of treatment and propaganda among students and military forces. In Siam during 1919, over 2,000 soldiers received treatment for hookworm infection, and in Nicaragua, Salvador, Guatemala, and other areas extensive curative and educational work was carried on among the school children. In Ceylon, lectures, demonstrations, and treatment campaigns were conducted, among other places, at the Government Training College for Teachers, at Colombo, and at the training colony for teachers conducted by the Church Missionary Society at Peradeniya. Teachers go from these institutions into government and mission schools throughout Ceylon. The co-operation of the schools will therefore be of inestimable value in future campaign work.

Co-operation of Business Organizations in the Work of Hookworm Control. In practically all areas in which anti-hookworm operations are being conducted the work has the co-operation of the managers of estates and manufacturing corporations. It is usually the custom for these organizations to allow their laborers a day at home with pay at the time of treatment, and many companies continue systematic examination and treatment of their employes after the original campaign has been brought to a close. The Demerara Bauxite Company of British Guiana, the São Jeronymo Coal Company of Rio do Sul, Brazil, the Pingshiang Colliery of China, the rubber estates of Sumatra, and the cane plantations of Fiji, represent a few of the organizations which are conducting systematic health work among their employes.

Corporations are awakening to the fact that care for the health of their employes will pay dividends in the form of greatly increased production. This fact is evidenced by the number of requests for co-operation in anti-hookworm campaigns which are being received from planters and manufacturers. Twenty large sugar manufacturers in Rio de Janeiro have agreed to furnish \$3,000 a year for three years toward the work of hookworm control among their employes, and a large number of Brazilian coffee planters have agreed to sanitize their plantations and to pay a share of the expenses of curative operations on these plantations. In British Guiana the Planters' Association has expressed a willingness to pay half or even two-thirds of the cost of an anti-hookworm campaign, and in anticipation of the completion of arrangements for this campaign one group of estates has appropriated \$10,000 to cover its share of the cost of the work.

Constant Vigilance the Keynote to Hookworm Control. When the co-operation of every available organization in hookworm-infected regions has been enlisted for the work of control, the solution of the hookworm problem will be in sight. The crux of the problem, however, was well stated by the Governor of British Guiana in a speech at the opening of the Combined Court of that

colony in December, 1919:—"I wish to express my emphatic disbelief in the idea that it is possible by any means whatever to stamp out hookworm disease once for all. The matter must receive constant attention all over the colony. By treatment and by sanitary measures in villages and on estates, it may be possible to reduce the hookworm to an almost negligible quantity, but the disease is like the locust plague in Cyprus. For forty years the crops there have been free from the ravages of these pests, but the scourge would be renewed were it not for the annual campaign against it."

VII

SOIL SANITATION AS A MEANS OF CONTROL

Fecal matter which contaminates the hands and feet is the crux of the hookworm problem. The contamination occurs mostly under rural conditions. The most important undertaking in all efforts to stamp out the disease is therefore to prevent the deposit, on the surface of the ground, of hookworm eggs contained in the feces. This may be accomplished by securing the provision and use of properly built and adequate latrines to serve as receptacles for the contaminated matter. To insure the installation, maintenance, and use of sufficient and satisfactory latrines is, however, a formidable undertaking. It involves the task of inducing hundreds of millions of people in the infected regions to abandon habits ingrained by centuries of usage and often dictated by the religions to which they adhere, and to accustom themselves to new and in some respects difficult habits, the necessity for which they must in some manner be brought to appreciate.

Defining the Problem by Sanitary Surveys. The original sanitary problem of each area of operations is defined by means of a house-to-house canvass during which the facilities that exist at each house for safely disposing of human excrement are carefully noted. This initial sanitary inspection is generally carried out in advance of the curative work. During the past year, statistics have been gathered as to the latrine conditions at homes in 185 rural or semi-rural areas in various tropical and sub-tropical lands. Classing as satisfactory any type of latrine that effectually prevents soil pollution and is fly-proof, only 9,381, or 9.8 per cent, of the homes in these areas were reported to have satisfactory accommodations, while 50,749, or 53.0 per cent, had no accommodations whatever when the curative work was undertaken. The situation on first inspection in a number of widely-separated but typical rural localities is instanced below to show the need of thoroughgoing sanitary reform if soil contamination is to be prevented and hookworm disease eventually controlled. The conditions in the areas mentioned are not unusual, but repeat themselves with greater or less fidelity in the different countries in which control measures are being undertaken.

a. Lack of latrines on São Paulo plantations. The survey of São Paulo completed during 1918 showed that on the coffee plantations of this state the owners' and managers' houses are generally the only ones provided with latrines. As a result, the soil around the coffee plants is infected with larvae and the workers constantly re-infect themselves. The soil is porous and is kept moist by the shade of the

coffee trees, and for the greater part of the year the temperature is fairly high. Conditions are therefore ideal for the eggs to hatch and for the larvae to develop.

b. Sanitary situation in selected areas of Southern States. In the entire rural area of Hart county, Georgia, not a single sanitary latrine was found at the time of first inspection. In South Carolina, among 5,703 homes in three counties, 3,334, or 58.5 per cent, were found to be provided with insanitary latrines of the open-back, open-seat variety. An additional 1,518, or 26.6 per cent, were without facilities of any sort for disposing of excrement. In Texas, only 13.7 per cent of 4,758 homes located in eight counties, had satisfactory conveniences when the work began. Two hundred eighty-five, or 6.0 per cent, had no conveniences at all.

c. Facilities for feces disposal in Queensland and Trinidad. In the infected regions of Queensland, Australia, the pail system, with burial of the contents, was in general use on first inspection, but the latrines were mostly of the open-back, open-seat variety, inadequate for preventing soil contamination. In the Caroní, Maracas, and Laventille areas of Trinidad, the sanitary conditions were reported to be very bad. In the Caroní area there were a number of heavily-infected villages in which not a single latrine could be found.

Methods Followed in Securing Sanitary Improvement. Practically all the states and countries which are carrying on measures against hookworm disease have adopted one or more types of latrines, and have made provision for a more or less complete system of inspection to insure the erection and use of these latrines in sufficient numbers to guard against soil pollution. The staff engaged in the curative work endeavors through its educational activities to bring all the people to appreciate the necessity of providing themselves with some form of latrine that will permit the safe disposal of excrement, and in each instance recommends the type or types of latrines adopted by the Board of Health of the state or country in which the work is being conducted.

INVESTIGATION OF SEWAGE DISPOSAL IN SOUTHERN STATES

The diversity of opinion among public health officials as to the best method of disposing of human excrement in rural communities with limited means, led the National Conference of State and Provincial Health Officers, at its meeting in Washington, D. C., on June 3 and 4, 1918, to urge the Surgeon General of the United States Public Health Service to appoint a special commission to study the subject and make recommendations. Action was taken and an experimental station was established at Wilmington, N. C. Preliminary reports indicate that the problem is even more complicated than was anticipated.

In January, 1916, the Board, recognizing that definite information on the subject would be of considerable assistance to local health authorities, had made provision for carrying out, under the direction of the Rockefeller Institute for Medical Research, a study of the types of latrines commonly used for disposing of feces in unsewered localities. It was hoped that from the facts brought to light it would be possible to evolve a method, or various methods, of disposal that would be safe and practicable under prevailing conditions.

Method of Approaching the Problem. The work was placed in charge of Dr. I. J. Kligler, of the Rockefeller Institute, whose studies, conducted over a period of two years, have sought to test experience under a variety of conditions. The problem was approached from both the field and experimental points of view. In the laboratory, repeated tests were made to determine the viability of typhoid and dysentery bacilli in soil and in excrement under different conditions, their ability to penetrate columns of soil of different degrees of porosity, their viability in septic fluids and effluents, and the nature of the antagonistic factors in soil and in septic material which influence their viability. In the field work, particular attention was paid to the extent of pollution of the soil surrounding privies, and the relationship that privies bear to the pollution of wells. The pit and the septic tank were the types of privies mainly studied, though other varieties, including the pail privy and the chemical toilet, came in for a limited share of attention.

Method of Conducting Studies in the Field. The studies of the septic tank centered on field investigations of thirty Kentucky sanitary privies, which had been in use for periods ranging from four months to three years. The L. R. S. type was investigated only in the laboratory. Practically all the Kentucky privies examined were of the rural type.

The pit privy was tested in five widely separated communities in the state of South Carolina. These communities presented practically all soil formations common to that state. The soil in the first was hard, red clay; in the second and third, sand-clay; in the fourth, sand on a sandstone bed, with a water-table eight to ten feet below the surface; in the fifth, sand and sand-clay. The privies, more than fifty in number, had been used from one to three years, and were studied during both the dry and rainy seasons.

In investigating the pit privy, specimens of soil were taken at different depths and at different distances from the pit, to learn the source and direction of any seepage that might be occurring. The effluent from septic tanks was also collected and examined, the soil samples being taken in the same manner as for pit privies.

Results of the Investigations. The main findings of the survey, subject to confirmation by more extended investigations, are: (1) that typhoid and dysentery bacilli succumb rapidly upon being

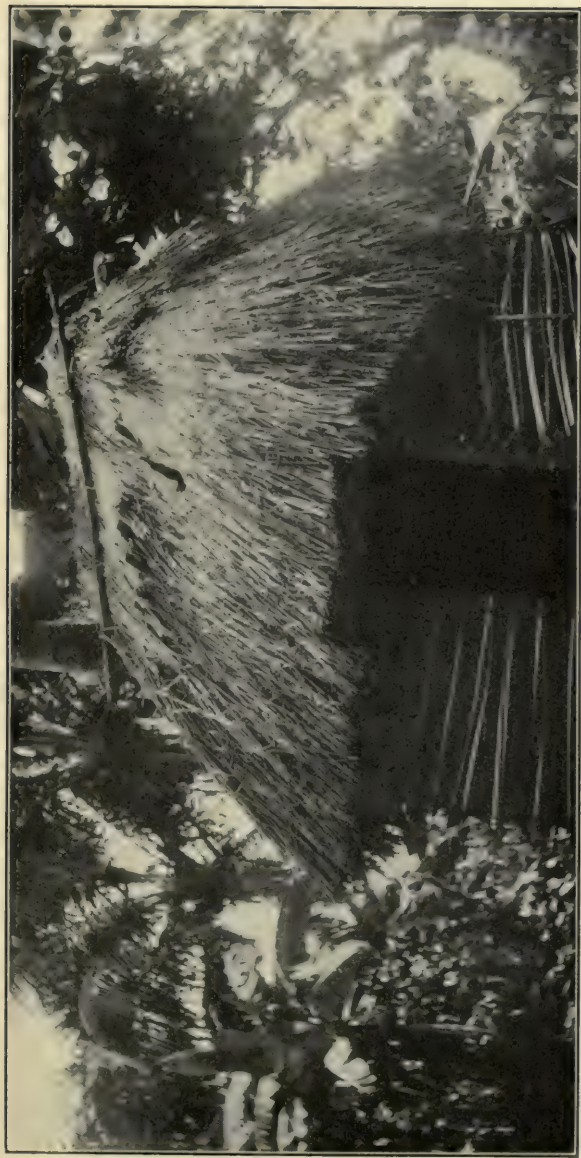


Fig. 55.—Accustoming primitive peoples to the use of latrines is fundamental to hookworm control. Type of fly-proof pit latrine, with thatched roof, erected in province of Veraguas, Panama



Fig. 56.—Type of latrine erected for boys' school in Santiago, Panama. Fly-proof, cement lined. Latrines such as this teach the gospel of sanitation to the growing generation

exposed to unnatural environment, consisting either of the effluent from septic tanks, of solid feces, or of soil; (2) that the spread of pollution from a focal point is limited in scope; and (3) that pollution of the wells, when it occurs, is usually derived from the surface. The experiments indicated that the vertical distance between the source of pollution and the ground water level, as well as the character of the soil, are the important factors for consideration in choosing the method to be employed in disposing of sewage. The horizontal distance between the polluted area and the well was found to be of relatively slight importance except where there are underground channels or cracks in the soil.

In moderately compact clay, sand-clay, or sandy soil, free from cracks, the possibility of subsoil pollution of the ground water from pits and septic tanks seems to be negligible if a vertical distance of at least ten feet is allowed between the fecal deposits and the ground water level. The pit privy is not considered safe in limestone regions or in soil where the ground water level is near the surface. For such localities the Kentucky sanitary privy or a privy of similar design, with sufficient storage capacity to allow time for the destruction of pathogenic bacilli, and with the drain placed from three to five feet above the ground water level, is thought to be best.

The results of Dr. Kligler's work will be published during the latter part of 1920 as an appendix to the *Journal of Experimental Medicine*.

Need of Additional Inquiry to Establish Preliminary Deductions. It is recognized that these experiments and tests are only preliminary in character, and that they have not yet been carried far enough for definite conclusions to be drawn from them. Conditions growing out of the war made it necessary to await favorable opportunity for a more extended study of the problem. The further study to be undertaken should include, among other subjects, a thorough investigation of the viability of the eggs of intestinal parasites.

Types of Latrines Recommended. In general, any means of disposal is acceptable if it provides against dissemination of infected material by flies, against pollution of the ground in places accessible to bare feet, and against the contamination of drinking water. Several methods that do this have been proposed. Among them may be mentioned the pit latrine, when fly-proof and so located as not to pollute the drinking-water supply; the fly-proof pail latrine, where the ultimate disposal of the night soil is under careful supervision and is satisfactory; septic tanks properly constructed; treatment of the feces with an effective chemical; incineration plants; and sewerage. There are practical considerations touching upon the relative merits of each of these methods, and in many countries, where the choice lies between two or more forms of disposal, it is

only the cheapest that the people in large numbers can be induced to use. This goes far toward explaining the present popularity of the pit privy.

a. *The earth pit latrine.* This is the simplest type of latrine. It is inexpensive and easily installed, and in sparsely settled areas where soil conditions give reasonable assurance that the water supply will not be endangered, it may be justifiable to use it. It is not, however, to be recommended for town or village use. Nor should it be employed in low, swampy lands where the ground water level is high, or in limestone regions where the stratified rock comes as close as ten feet from the surface. Where the rock strata are tilted the danger is particularly great. Tunnels made by beetles or other insects may be responsible for contamination between pit and water supply.

b. *The concrete vault latrine.* A recent development in tight vaults that has given satisfactory results, is the double-compartment concrete vault latrine. The compartments of this latrine are used alternately for periods of at least six months. When a compartment becomes filled, it is completely closed and its contents are allowed to remain untouched during the time the second compartment is in use. During the period of disuse, the excrement in the first compartment diminishes in volume and becomes comparatively inoffensive to handle, especially if a little dry earth or, preferably, lime has been added each time the latrine is used. Experiments are now under way to determine whether this residue would be safe and valuable as a fertilizer. This latrine can be erected in any location. Like the earth pit type, it can be home-made.

c. *The pail latrine.* This type of latrine, in which a pail, enclosed in a fly-proof compartment, is substituted for a pit or vault, is, next to the earth pit latrine, the most inexpensive type to install. A community can be quickly and cheaply supplied with these conveniences by letting out to one carpenter the contract for the entire number required. The latrine has in addition the advantage of being adaptable for indoor as well as outdoor use. Its capacity, however, is extremely limited, and it should be emptied every few days. It is not to be recommended except for communities having well organized and carefully supervised scavenger service. Moreover, with the present high cost of labor, its upkeep involves considerable expense.

d. *The septic tank.* The septic tank is based on the principle that when fecal matter is deposited in water in certain proportion and permitted to remain in storage for a suitable length of time, there is propagated a growth of bacteria which converts the greater portion of fecal solids into inoffensive liquid form, thereby facilitating ultimate disposal by absorption into the ground or discharge into streams. The small residue of fecal material which does not yield to the liquefying action of the bacteria settles in the bottom of the

tank. Only at yearly intervals or longer must this accumulation be removed. The cost of maintaining this type of latrine is therefore very small. It involves only the purchase of toilet paper, which must be used because of the fact that other materials clog the latrine and destroy its effectiveness.

The superiority of the septic tank over other types of latrine cannot be questioned. The initial cost of the structure, however, is so high as to make it prohibitive for general use in the average rural community or small town. It is important that the septic tank be carefully differentiated from the so-called septic latrine. The former receives the necessary water supply by means of automatic flushing, while the latter requires that the user add water, from time to time, in required quantities.

e. The chemical latrine. The basic principle of the chemical latrine, like that of the septic tank, is the liquefaction of excrement. In this case the process is accomplished by the action of some caustic substance. The latrine is provided with an iron tank of sufficient size to allow the storage of the liquefied waste for from six months to a year. When the tank becomes filled, the liquefied matter is removed, either by drainage into an underground filter-bed or cess-pool, or by being pumped out into a tank wagon. The liquefying powers of this latrine surpass those of the septic tank latrine, and in addition it accomplishes a higher degree of purification and deodorization. It is better suited to indoor use than any other type of latrine. But both its initial cost and the cost of maintenance are high, and in its present state of development the chemical latrine is not permanent but must be replaced from time to time.

f. Incineration plants. A good incineration system effectually prevents the pollution of water in wells, lakes, or streams, and at the same time provides a thoroughly sanitary method for the accumulation and disposition of waste matter. By this method the waste is usually collected in an especially devised container which ordinarily is so planned and constructed as to preclude the possibility of human contact or of approach by flies. When this container has been filled to capacity, the waste is fired and reduced to ashes. The incinerator is then ready for another accumulation. There is one very marked advantage of the incineration method of sewage disposal: it can be used where a sewer system is impractical on account of certain soil conditions, drainage difficulties, discharge outlet, or other obstacles.

g. Sewerage. The water-carrier sewerage system, with safe and satisfactory disposal of the sewage, is, from the standpoint of health and sanitation, the ideal method of waste disposal. It is not always practicable or economically possible to install such a system, particularly in towns or cities with small populations or limited resources, and it is seldom feasible in rural areas. For such localities the health officer may have no choice but to recommend some other less satis-

factory form of disposal. Sewerage is, nevertheless, the one system which can be given unqualified endorsement, and is the one toward which all communities—rich or poor, large or small—should be encouraged to strive.

SOIL SANITATION IN ADVANCE OF TREATMENT

There is a growing tendency for governments to arrange for the proper disposal of excrement in advance of the examination and treatment of the people. Ceylon led the way in this movement. Government regulations enacted in that colony during 1916 required all estates to erect adequate latrines for their laborers before the expiration of one year. As a result, the new estate areas in which work was undertaken during the past three years were provided with latrine accommodations before the curative work was inaugurated. This situation will hold true with respect to all other estate areas that are selected for work in this colony. A similar movement is reported from Brazil, Queensland, the Seychelles Islands, China, Siam, Costa Rica, Nicaragua, Salvador, and from all the West Indian colonies in which work is being conducted or is proposed. The Australian authorities also are reported to be favorably disposed toward making the installation and use of latrines a pre-requisite to the opening of work for hookworm control on the estates of Papua.

Value of Elapse of Dry Season Between Sanitary Operations and Curative Measures. During the original campaign in Nandasmoo, Nicaragua, a portion of the population received treatment and were provided with latrines during the dry season. Another portion did not receive treatment or inaugurate sanitary measures until after the onset of the rains. Re-examinations made eighteen months later showed that among persons in the former group there was 43 per cent re-infection, while in the latter group a re-infection rate of 67 per cent obtained. Since it is probable that a large part of the re-infection in this area was caused by old soil infection, the disparity in re-infection rates between the two groups indicates that the danger from old soil infection is greatly lessened during the dry season, owing probably to the desiccation of a large proportion of the larvae. This fact suggests that if sanitary work is done in an area far enough in advance to permit one dry season to intervene before the inauguration of curative measures, old soil infection will be reduced to a minimum, and, with the proper enforcement of sanitary regulations, there will be less danger of re-infection.

PRE-CAMPAIGN SANITATION IN WEST INDIAN COLONIES

In every West Indian colony in which measures for the control of hookworm disease were conducted during 1919, and in every colony where it is proposed to conduct work during 1920 or 1921, Govern-



Fig. 57.—Type of fly-proof pit latrine with wooden superstructure. Many hundreds of latrines of this type have been erected on the estates of Ceylon, in an effort to overcome wholesale pollution of the soil

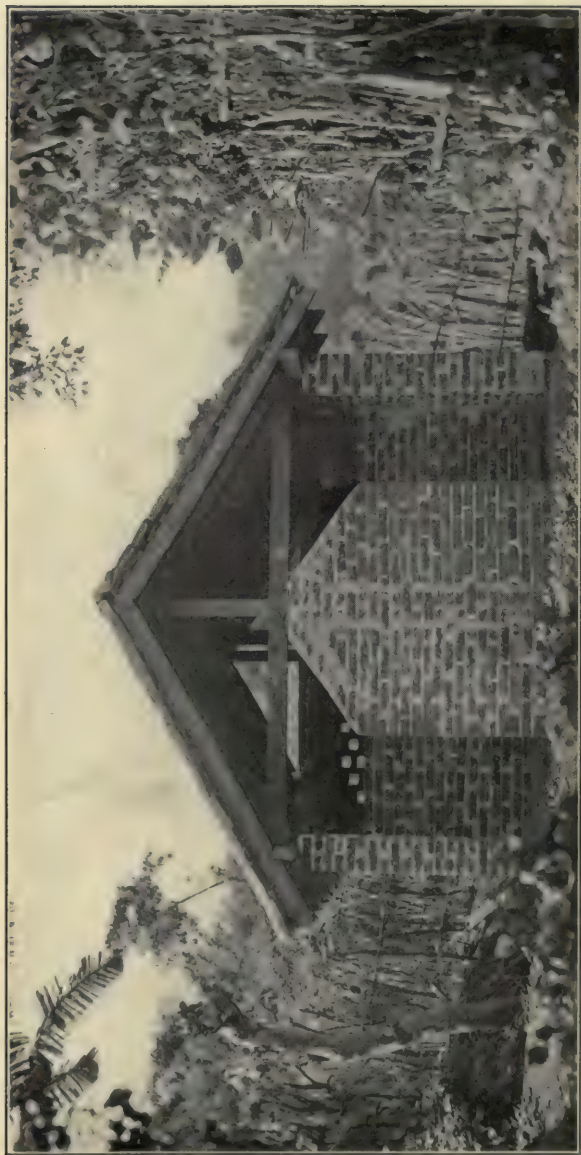


Fig. 58.—New latrine of the bucket type with brick superstructure, erected on the Syston estate. It was on this estate that the first latrine was built in connection with the campaign against hookworm disease in Ceylon

ment has obligated itself to sanitize thoroughly each area of operation well in advance of the inauguration of treatment campaigns. Latrines of a standard type approved by the boards of health of the respective colonies will be required, and permanent staffs of sanitary inspectors will be provided to enforce sanitary regulations. All areas worked during 1919 in Trinidad and Jamaica secured a satisfactory percentage of latrine installation prior to the inauguration of control measures. In Trinidad the Central Board of Health passed a resolution making it an offense punishable by law to deposit human excreta, or to defecate, except in properly constructed latrines, anywhere within a quarter of a mile of an occupied building. For the enforcement of sanitary regulations in this colony seven sanitary inspectors were employed during 1919 and provision was made for the employment of twelve inspectors during 1920.

SANITARY PROGRESS IN CENTRAL AMERICA

In Central American countries exceptional difficulties stand in the way of latrine construction. Most of the inhabitants are so poor that they find it difficult to sustain existence. They have therefore been backward in accomplishing definite results in sanitation. During 1919, however, excellent progress was made in latrine construction in all the republics in which control operations were conducted. These countries, moreover, are developing an effective personnel for the enforcement of sanitary regulations. In many areas earnest effort was made to secure the sanitation of all homes at least six months in advance of treatment campaigns. In Nicaragua, 3,500 latrines were erected, the largest number constructed during any year since the work of hookworm control began, and the greater number of these latrines were provided in areas where it is proposed to establish curative measures during 1920. In the course of the year, Government appropriated \$3,000 for the employment of four sanitary inspectors, and several municipalities contributed funds to maintain local inspectors.

In Costa Rica, Government furnished eleven inspectors to enforce sanitary regulations, and each municipality in which work was conducted furnished at least one. In the counties of Alajuela and Tibas, municipal inspectors started compulsory latrine construction three months prior to the inauguration of control measures. Salvador reports greater progress in sanitation during 1919 than in any previous year. Several municipalities in this republic claim to have secured the pre-campaign sanitation of 60 per cent of their homes. These encouraging results are due in large measure to the earnest cooperation of government officials. During the year the President of Salvador sent a letter to governors of departments, suggesting that latrines be erected by every householder throughout the departments, and that monthly reports of latrine construction be forwarded

regularly to him. The Minister of Public Instruction issued an order that all schools be provided with latrine facilities and that inspectors be appointed to enforce the ordinance. Attention was also concentrated during the year on the erection of latrines at military barracks. In Panama, Government put into execution a decree making the construction of latrines obligatory throughout the country. The number of latrines erected in the interior of this country during the year, surpassed the total number built during all previous years of work.

ESTATE SANITATION IN CEYLON

Before the opening of work against hookworm disease in Ceylon, few estates had latrine accommodations for their labor, and the houses in the villages were seldom equipped with sanitary conveniences. Now practically all estates have latrines. From the beginning of work in January, 1916, up to the end of 1918, approximately 50,000 latrine compartments, sufficient to provide accommodations for 700,000 persons had been installed. The great problem now confronting campaign workers is to bring about the use of the latrines that have been built.

Difficulty of Enforcing Use of Latrines on Estates. On all the estates the latrines are used to greater or less extent, but there is still considerable evidence that the soil is being polluted. This pollution commonly occurs about laborers' quarters and along bridle paths. The estate superintendents' efforts to improve sanitary conditions will require time to yield results, as the laborers are indifferent in using latrines. Nevertheless, it is encouraging to report that the number who do use them is steadily increasing.

Adequate System of Latrine Inspection Needed for Estates. During 1919 Government issued a decree making soil pollution an offense punishable by law. It now remains to establish a regular system of inspection to bring about the proper use of latrines and as a last resort to apprehend offenders. The Senior Sanitary Officer has a competent body of trained sanitary inspectors, but their activities are confined in the main to sanitary board areas and to special districts where conditions are particularly unsatisfactory. The extension of this work to reach all of Ceylon is to be the next step.

VILLAGE SANITATION IN CEYLON

Much of the infection and re-infection on estate areas is probably acquired in the villages and bazars included within the boundaries of these areas or situated closely adjacent to them. Until recently no latrines had been erected in these localities, but Government,



Fig. 59.—Different countries employ different means of guarding against soil pollution. Type of pail latrine adopted for use in Queensland, Australia. Manufactured and sold in wholesale lots



Fig. 60.—Example of one of the better methods of night soil disposal. Type of incinerator adopted for use on all estates belonging to Messrs. George Steuart and Company, Ceylon

recognizing the futility of treating and curing the estate laborers only to have them re-acquire the infection on their visits to the villages or to the largely patronized bazars, has lately issued orders to the village headmen and other authorities to have latrines constructed for village and bazar communities. In the Matale area the sanitary department has had from two to four qualified inspectors at work for more than three years, extending the latrine and privy system throughout the villages. Nearly 3,800 village latrines were erected in this area during 1919. In the village communities in or near other estate areas in which treatment campaigns were conducted up to December 31, 1919, many additional latrines have been installed, but the absence of an adequate system of inspection has sometimes resulted in these latrines being of an inferior type.

Installation of Latrines in Southern and Western Provinces.

It is estimated that in villages located in other parts of the colony, between 75,000 and 90,000 latrines have been built since the beginning of 1916, nearly all of them by the villagers themselves. Of these, 480 were installed in 1916 and 25,215 in 1917. About 12,000 were erected in 1918 and over 37,000 in 1919. In the rural parts of the Southern province, with a population of about 600,000, privies to the number of 45,000 have been erected during the past three years, more than 40,000 of them during the past eighteen months. These are sufficient to provide accommodations for at least 200,000 persons.¹ The villagers built all of these latrines without prosecution and are using them without reluctance. By special tax and with a government grant and loan, 40,000 rupees were made available for the erection of latrines in two towns of this province—Matara and Weligama—during 1919. Extensive sanitary improvements have also been made at Minuwagonda and surrounding villages in Western province. Here the whole township, with a population of about 9,000, and the villages within a two-mile radius, having a combined population of 3,000 or 4,000, have been provided with sufficient latrines. Sanitary surveillance is to be maintained by qualified inspectors, who will also carry on educational work, including lantern talks, on health subjects. In the whole of Western province during 1919, more than 10,000 latrines were erected.

Latrine Building As Means of Interesting Villagers in Hookworm Relief Measures. Paradoxically, the installation and use of latrines afford the best entering wedge for work among the Singhalese villagers who form the permanent population of Ceylon. Lantern talks by native dispensers gain the sympathy and interest of the villagers, lead to extensive privy building, and later to a request for the establishment of dispensaries to extend to the villagers the opportunity of being treated. If opportunity for treatment is held out to them as a preliminary first step, they refuse; but after they

¹These figures take no account of local board or sanitary board activities.

have been brought to install latrines in large numbers and to realize the benefits which attend their use, effective curative work can readily be conducted among them.

SOIL SANITATION IN BRAZIL

In Brazil extensive provision is being made for the sanitation of rural areas. The states of São Paulo, Minas Geraes, Paraná, Bahia, and Rio de Janeiro have already adopted rural sanitary codes requiring the provision of latrine accommodations at every home within their jurisdiction. Under forthcoming regulations of the National Department of Public Health, any state accepting aid from the Federal Government for control of rural endemic diseases must adopt a modern rural sanitary code prepared by the department. The Federal Government will appoint officials to execute the law within each state. The greatest progress made in soil sanitation in Brazil during 1919 was on Governor's Island where, by the end of the year, all but a dozen of the 8,000 homes were provided with latrine accommodations.

INSTALLATION OF LATRINES IN THE SEYCHELLES ISLANDS

During the three years in which control measures have been in operation in the Seychelles Islands remarkable progress has been made in sanitation. When work was begun there in 1917 hardly a latrine was to be found anywhere in the colony outside of the town of Victoria. By the end of 1919, however, it was difficult to find a home on the islands unprovided with latrine accommodations. Sanitary laws are strictly enforced throughout the colony and most of the latrines are kept in good repair. There are few instances of soil pollution, and such offenses of this nature as do occur are usually traceable to children. On the islands of Praslin and La Digue, where curative work was conducted during 1919, over 98 per cent of the homes were supplied with good pit latrines before control measures were undertaken. The government of Mauritius has recently given \$32,400 to the Seychelles Government, and the Governor has sanctioned the use of as much of this sum as may be necessary for the installation of public latrines at the most convenient locations throughout the Seychelles.

LATRINE PROVISION IN QUEENSLAND

Scarcity of labor and the almost prohibitive cost of lumber have stood somewhat in the way of complete compliance with the health act of Queensland, which empowers local authorities of each shire or township to enforce latrine construction throughout their districts.

To counteract the difficulties of securing labor and material, a standardized box latrine unit has been adopted which can be manufactured in large quantities and can have placed upon it any superstructure that the householder may have available. This device reduces the cost of a unit to about \$10, a price usually within the reach of the householder. A high percentage of latrine improvement was secured during 1919 through the co-operation of the town councils, which are enforcing throughout their jurisdictions the installation and use of sanitary devices for sewage disposal. Several towns in the state have let contracts for incinerators for night soil disposal, each of these devices to cost approximately \$5,000.

SANITATION OF THE SOIL IN SOUTHERN STATES

During recent years considerable progress has been made in soil sanitation throughout the Southern States, and the movement is steadily gaining momentum. Harrison, Stone, and Jackson counties, of Mississippi, report that an improved latrine has been installed at every one of their rural homes. Harrison was the first county in the South to achieve this enviable distinction. The work done in this area afforded practical illustration of what can be accomplished in health protection, and stood out as one of the prominent movements in the state. In various other Southern counties the record of latrine construction for rural homes ranges between 50 per cent and 100 per cent. Nine state boards of health report that during 1919 an aggregate of 12,250 new latrines were erected and 6,660 old latrines were improved. In North Carolina, the General Assembly enacted a state-wide sanitary latrine law which requires all latrines located within 300 yards of a home to be constructed and maintained in a manner satisfactory to the State Board of Health.

HEALTH IMPROVEMENT FOLLOWING SOIL SANITATION

Hookworm disease is not commonly a reportable disease. Consequently there are few morbidity or mortality statistics to aid in ascertaining its prevalence at any particular time. Following the inauguration of control measures in nine counties of North Carolina, the rate of hookworm infection was reduced from 35 per cent for the years 1911-1914 to 19 per cent for the years 1917-1919. In the Pinghsiang Colliery, China, where sanitary regulations are being strictly enforced, the incidence of infection among the mining population has been reduced from 85 per cent in 1917 to 36 per cent in 1919, and in the Seychelles Islands the infection rate shows a reduction from 96 per cent in 1917 to 51.1 per cent in 1919.

Typhoid fever is a reportable disease, and interesting statistics are available showing the reduction in morbidity and mortality rates for this disease, following the use of adequate latrines. In Orangeburg county, South Carolina, where a rural sanitary campaign has been in progress for three years, the typhoid death rate has been reduced 75 per cent, and in Darlington county in the same state, a two-year campaign has reduced the death rate from this disease 80 per cent. As practically no typhoid inoculations have been given in these areas it would seem that soil sanitation was the controlling factor in this reduction. Adjoining these counties are several counties where no sanitary work has been done. In two of these the typhoid death rate for 1919 showed an increase of 200 per cent, and in another, an increase of 25 per cent, over the preceding year.

In Troup county, Georgia, where in the course of a two-year health campaign 2,895 sanitary latrines were installed, there has been a marked decrease in the incidence of typhoid fever and dysentery. Morbidity statistics for 1919 show typhoid fever to be only about 30 per cent, and dysentery about 12 per cent, as prevalent as before the work of sanitation was begun.

Vital statistics for the year 1919 for Smith and Gibson counties, Tennessee, show very definite diminution in morbidity and mortality rates for intestinal diseases, following rural sanitary campaigns inaugurated in those areas in May, 1919. Smith county reports a reduction of 50 per cent in the number of typhoid fever deaths. In deaths from typhoid fever and all other intestinal diseases combined, there was a reduction of 55 per cent. Gibson county shows a reduction of 20 per cent in the incidence of typhoid fever, and of a fraction more than 50 per cent in that of intestinal diseases inclusive of typhoid.

In Stone county, Mississippi, an intensive campaign against soil pollution was begun in May, 1918. At this time there were less than a dozen sanitary latrines throughout the entire area. By June 1, 1919, when intensive operations were completed, every home in the county had been provided with an improved latrine. During the first six months of 1919, for the first time in the history of the county, not a single case of typhoid fever was reported. In the same state, in Marion county, an intensive sanitary campaign was waged from February 1 to December 31, 1919. At the beginning of the work less than 1 per cent of the homes met the sanitary requirements of the state board of health. By December, as many as 1,192 homes had sanitary latrines. County statistics for the year show a decrease of 25 per cent in typhoid fever cases and of 68.9 per cent in cases of amebic dysentery.

In Fairfax county, Virginia, where a crusade against soil pollution was begun in April, 1917, there has been a notable decline in typhoid incidence and mortality. In 1917 the morbidity rate for this disease was 2.0 per thousand and the mortality rate .13 per thousand. In 1918 the morbidity rate fell to .5 per thousand and no deaths

occurred. In 1919 the morbidity rate was .34 per thousand and the mortality rate .04 per thousand.

In the town of Salisbury, North Carolina, where in 1918 a sanitary latrine was built at every home not connected with a sewer, there were only two cases of typhoid fever during 1919, as against forty-three cases during the preceding year. In the entire state of North Carolina during 1914, the first year in which deaths from all causes were recorded, there were 839 deaths from typhoid fever. Since that year there has been steady progress in rural sanitary work throughout the state, and a correspondingly steady decrease in the incidence of typhoid fever. In 1919 there were only 427 deaths from this disease, or 412 fewer deaths than in 1914. Each death from typhoid means at least ten cases. A decrease of 412 in the number of deaths means, therefore, the prevention of 4,120 cases of the disease. Rosenau places the average cost of a case of typhoid fever at \$400. On this basis the prevention of 4,120 cases of typhoid may be estimated as having saved the state about \$1,648,000 a year. The prevention of typhoid is but one of many beneficial results of soil sanitation.

VIII

MALARIA CONTROL

Measures for the control of malaria in densely populated communities, 'by means of the prevention of mosquito breeding, were inaugurated early in 1919 in four Arkansas towns: Eudora, McGehee, Blissville, and Tillar. In addition, supervision was given throughout the year to the maintenance of conditions which had been established as the result of the earlier efforts at mosquito control, by the same means, which had been carried out in six other Arkansas towns: Crossett, Hamburg, Lake Village, Dermott, Monticello, and Bauxite. The program was carried out in conjunction with the United States Public Health Service, the municipalities concerned, and the Arkansas State Department of Health.

Malaria Control by Anti-mosquito Measures: in Towns. The plan of operations followed in the original work at Crossett and Hamburg, with improvements suggested by experience or required to adapt the work to local conditions, was followed in the four towns to which the work was extended during 1919. For the four communities combined, physicians' calls were reduced from 3,394 (the average for the two previous years) to 1,120 in 1919—a reduction of 67 per cent. The per capita cost of the entire work, with overhead expense omitted, was \$0.60. The results and costs by communities are shown graphically in Fig. 61, page 219.

The maintenance record for the towns of Crossett, Hamburg, Lake Village, Dermott, Monticello, and Bauxite, in which control measures had been inaugurated in earlier years, is exhibited graphically in Fig. 8, page 87. Fig. 62, page 220, gives the percentage of reduction and the per capita cost of the work in these towns, as ascertained over the whole period of operations. The statistics demonstrate the practicability of anti-mosquito measures as a means of controlling malaria in communities of this type, from the standpoint both of expense and of degree of control attained.

Extension of Anti-mosquito Measures to Towns in Other States. The success of the extra-cantonment work for the control of malaria, as conducted by the United States Public Health Service during the war, and of the demonstrations in malaria control which have been conducted in Arkansas over the four-year period extending from 1916 to the beginning of 1920, have led to the development of a program for continuing the work in Arkansas and for extending it to selected towns in nine other southern states. The plan calls for joint participation by the United States Public Health Service, the state boards of health of the respective states, selected towns in each state, and the International Health Board. Surveys were begun during the latter part of 1919.

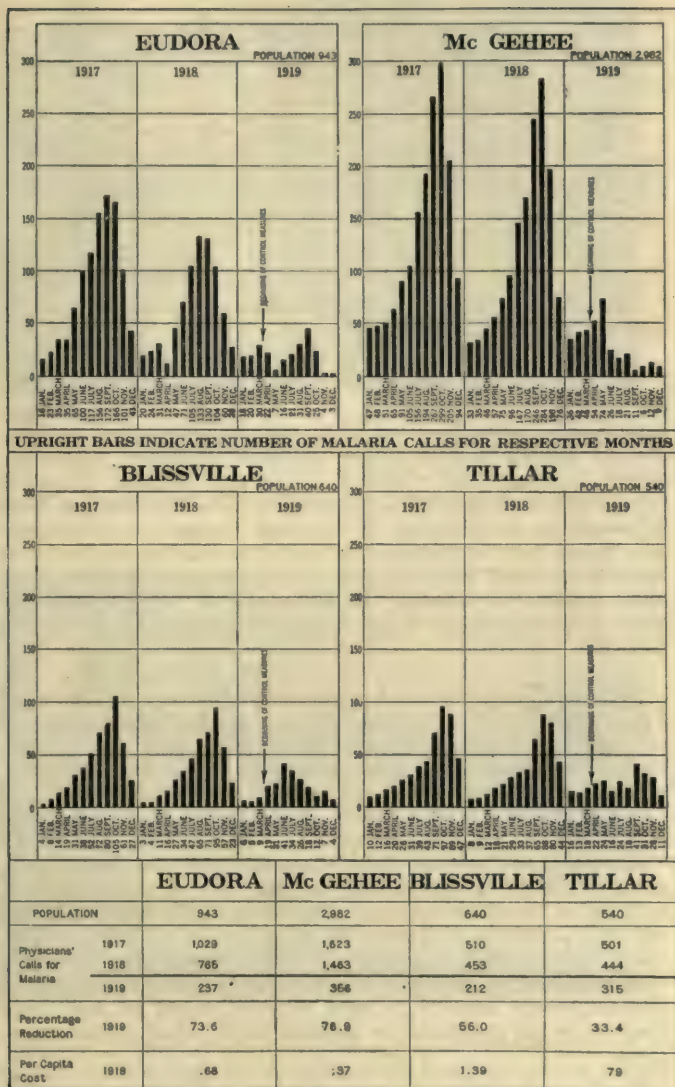


Fig. 61.—Record of malaria control in four Arkansas towns. Work was inaugurated in these four towns in 1919

	CROSSETT	HAMBURG	LAKEVILLE	DERMOTT	MONTICELLO	BAUXITE
POPULATION	2,029	1,285	975	2,760	3,023	2,500
Physicians' Calls for Malaria *						
1915	2,500	-----	-----	-----	-----	-----
1916	741	2,312	1,817	1,399	1,413	862
1917	200	269	1,388	1,248	1,274	779
1918	79	59	83	162	137	172
1919	77	33	96	84	81	47
Percentage of Reduction for Entire Period of Work	86.9	98.6	94.0	93.6	94.0	94.1
Per Capita Cost: **						
1916	\$ 1.24	\$ ----	\$ ----	\$ ----	\$ ----	\$ ----
1917	.63	1.45	-----	-----	-----	-----
1918	.53	.44	1.25	.54	.46	1.11
1919	.62	.78	1.08	.65	.44	1.14

Fig. 62.—Results and costs of anti-mosquito measures in six Arkansas towns, 1916-1919

The new program contemplates that operations will be limited in the main to towns of from 500 to 6,000 inhabitants. Co-operative work is proposed for forty towns, having an aggregate population of 177,320, located in seven states: Alabama, Louisiana, Mississippi, North Carolina, South Carolina, Texas, and Virginia. Excessive rainfall and a shortage of sanitary engineers caused a temporary delay in completing the programs for Arkansas, Georgia, and Tennessee. It is hoped that the strategically located demonstrations over wide areas in the South will eventually lead to the organization of state-wide crusades for reducing the prevalence of the disease in the various commonwealths of the United States which now suffer from malaria.

Malaria Control by Anti-mosquito Measures: At Scattered Farm Homes. The field work in Arkansas having demonstrated the feasibility of anti-mosquito measures as a means of controlling malaria in selected urban communities, Dr. H. H. Howard began, in June, 1918, a series of investigations to test the practicability of controlling malaria in rural regions. For these studies a rural district was selected in the northern part of Hinds county, Mississippi. This district has an area of approximately thirty-six square miles and a population of 830. During the year 1918 work was limited to a survey of the district and to a study of mosquito breeding within the area. Early in 1919 plans for mosquito control were put into operation in a selected area of twenty-two square miles within the district previously surveyed. It was decided that the remaining fourteen square miles of the area surveyed should be kept under observation but should not be included in the actual control operations.

Results of 1919 Control Measures in Hinds County. During 1918 there was 18.1 per cent of clinical malaria among the 955 inhabitants in the section of Hinds county above referred to; under control



Fig. 63.—One phase of mosquito control in rural regions. Mill pond in Hinds county, Mississippi. Was breeding anopheles continuously throughout season



Fig. 64.—Same pond as in Fig. 63, after being drained, cleaned, and edged. The control operations put a stop to breeding in this pond



Fig. 65.—Pond in Hinds county, Mississippi, after being cleaned and edged, and stocked with top minnows. Mosquito breeding in this pond was satisfactorily controlled by the use of fish

work the rate for the same area during 1919 was 5.5 per cent. The reduction for 1919 was therefore 69.2 per cent. In the section of the county which was kept under observation but not covered by the control campaign, the incidence of infection among the 214 inhabitants was 17.3 per cent during 1918, as against only 10.3 per cent during 1919—a reduction of 40.5 per cent. Taking 40.5—the reduction rate for the area not under control during 1919—as the normal decrease that would have occurred without systematic efforts to reduce the incidence of infection, the reduction that resulted from the control measures may be estimated at 28.7 per cent.

Cost of 1919 Operations in Hinds County. In anti-mosquito work in rural regions the large area to be controlled per individual makes it extremely difficult to maintain low per capita costs, and thus bring the work within the means of the people. The total cost of the operations conducted in Hinds county during 1919 was \$1,550.90, without overhead expense; the cost per capita, on the basis of a population of 595, was therefore \$2.60. This cost is high in comparison with the figures established for the Arkansas towns, and it still remains to be demonstrated that effective malaria control can be accomplished within the resources of local communities. During 1920 further effort will be made to reduce the per capita cost to the lowest possible figure consistent with a satisfactory degree of control.

Use of Top Minnow to Prevent Mosquito Breeding. The chief feature of the 1919 experiment in Hinds county was a thorough test of the efficacy of the top-feeding minnow (*Gambusia affinis*) as an agent in the prevention of mosquito breeding. This fish was used especially to destroy mosquito larvae in stock ponds and other similar breeding places. Heavy rains greatly retarded the progress of operations, and it was not until July 1 that effective control measures could be applied throughout the area. By September 30, however, 88.7 per cent of all the mosquito-breeding places in the area were being controlled, with a large measure of success, by top minnows alone. These agents continued their work until cold weather intervened and stopped mosquito production. If the further tests to be conducted with these fish in Hinds county during 1920 substantiate the earlier indications, this simple and inexpensive measure will doubtless be widely employed as a recognized agency for reducing malaria in regions where conditions will permit of its use.

MALARIA CONTROL BY TREATING THE CARRIERS

The control of malaria in sparsely settled and frequently flooded rural areas is more difficult than in towns or rural areas where the prevention of mosquito breeding by oiling or draining is economically feasible. In the former regions, the method of attack most commonly relied upon is that of attempting to destroy the parasite in the

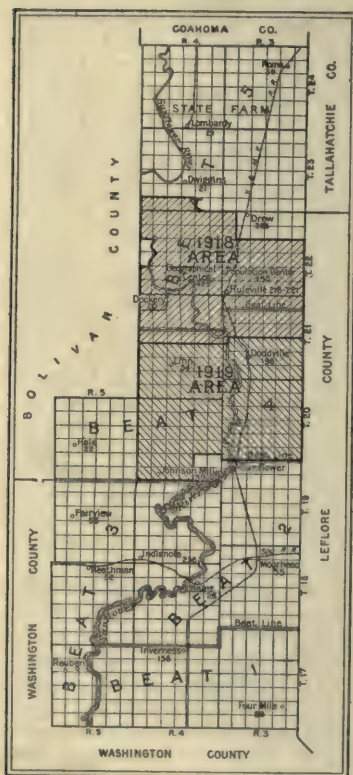


Fig. 66.—Map of Sunflower county, Mississippi, with location of 1918 and 1919 demonstration areas in malaria control by treatment of carriers

blood of the human carriers. A two-year field experiment in control measures by this plan was carried out in a section of Bolivar county, Mississippi, during the years 1916 and 1917. During 1918 and 1919 the control measures developed in the initial experiment were given trial in two limited areas of Sunflower county in the same state. The demonstrations conducted in the latter areas during the last two years have been suggestive, but far from complete. They will need to be continued over a period of years and under a variety of conditions, in this and in other areas, and with a greater measure of success, before they can be regarded as definite and final.

Plan of Malaria Control Work Pursued in Sunflower County. The first demonstration in malaria control by treating the carriers was undertaken in Sunflower county in 1918. It was conducted in an area of 100 square miles, and was based upon the gratuitous distribution of quinine to the people as a means of curbing malaria attacks and driving the parasites from the blood. When the 1919 work was projected it was thought that operations might be extended to the entire

county by discontinuing the free distribution of quinine and substituting mass education for the house-to-house propaganda of the previous year. It was soon learned, however, that with the personnel available the contact with the people was not intimate enough to result in large numbers taking quinine regularly for a period sufficiently long to immunize their blood. The treatment campaign was accordingly restricted after July 1 to an area of 110 square miles, with a population of approximately 5,500. The plan pursued here was similar in all respects to that followed in the 1918

work, except that no free quinine was provided. Throughout the remainder of the county, publicity work and the sale of quinine at cost were continued.

Results of 1918 Efforts in Sunflower County. Re-surveys were made during 1919 in more than half of the communities of Sunflower county in which anti-malaria operations had been conducted during 1918. Each community was re-visited approximately twelve months from the date of the first survey. Record was taken of the number of malaria attacks that had occurred in the interval; blood examinations were made; and for the first time during the demonstrations of control by the treatment of carriers, figures were compiled showing

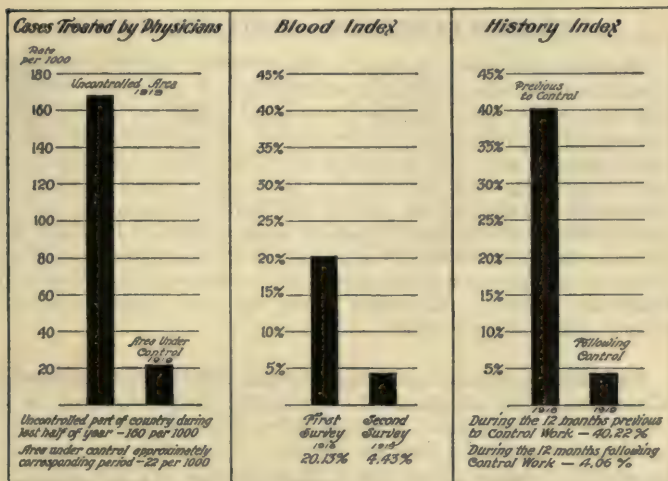


Fig. 67.—Reduction of malaria through treatment of carriers. 1918–1919 control areas in Sunflower county, Mississippi

the number of physicians' calls for malaria. The figures for physicians' calls covered the record for the county as a whole. Fig. 67 shows graphically the reduction in malaria accomplished by the control operations, as indicated by each of the three separate measures of results: history index, blood index, and physicians' calls. As based on history index, the 1919 incidence was 90 per cent lower than that of 1918; as based on blood examination, 78 per cent lower. The record of physicians' calls indicated, furthermore, that within the restricted area where control measures were applied, the 1919 incidence of malaria was 87 per cent lower than throughout the county as a whole.

Cost of 1918 and 1919 Control Demonstrations in Sunflower County. During 1918 the per capita cost of the intensive control measures conducted in Sunflower county, within the selected area of 100 square miles, was \$1.08. The per capita cost of operations within the area of 110 square miles chosen for the control demonstration of 1919, was approximately \$1.09. From the evidence at hand it appears that within this area the disease has been measurably reduced at a per capita cost well within the means of the average rural community, and that in addition the fundamental facts concerning malaria and its treatment have been brought to the attention of a large proportion of the county's entire rural population.

STUDIES IN QUININE ADMINISTRATION

The administration of quinine by mouth quickly destroys the adult germs, but the spores are not so readily reached and killed. Within the last twenty years quinine in enormous quantities has been administered in various parts of the world, particularly to soldiers or other persons who visit malarious districts. Many investigations have been made as to the effect on the human system of different dosages of the drug under varying conditions of treatment, and as to the efficacy of the drug in curbing acute attacks and driving the parasites from the blood. This was one of the points that was given foremost consideration in the early experimental work in Bolivar and Sunflower counties. More than 25,000 cases were closely observed over a period of three years.

Standardized Quinine Dosage Used in Bolivar and Sunflower Counties. The standardized immunizing dosage adopted as a result of the experiment was ten grains daily for eight weeks for adults, with graduated doses for children. For curbing acute attacks in adults, a dosage of ten grains three times a day was adopted. The proportionate dose required to produce in children of different ages the same effect as the full dose produces in adults is shown below:

<i>Age</i>	<i>Proportion of Adult Dose</i>	<i>Dose for Children of Different Ages as Based on Adult Dose of 10 grains</i>
Under 1	0.05	$\frac{1}{2}$ grain
1 year	0.1	1 grain
2 years	0.2	2 grains
3-4 years	0.3	3 grains
5-7 years	0.4	4 grains
8-10 years	0.6	6 grains
11-14 years	0.8	8 grains
15 and over	1.0	10 grains

Administration by mouth was the only method used except in rare instances. The administration of the dosage every day for eight weeks disinfected 90 per cent of the infected persons to whom it was administered. The remaining 10 per cent, who suffered from acute attacks, had to be given ten grains three times a day for three or four days, and then ten grains daily for eight weeks. Daily administration disinfected a considerably larger proportion of cases in a given length of time than intermittent treatment on one or two days of the week. The entire eight weeks' treatment was prescribed at one time, and the patients were advised and urged to take it without missing a single day. Otherwise, it was pointed out to them, there was a possibility of relapse.

Adoption of Standardized Immunizing Dose of Quinine by National Malaria Committee. Other investigators in different parts of the world have suggested the same immunizing dose of quinine as was adopted for the experimental work in Bolivar and Sunflower counties. The National Malaria Committee has adopted the dosage, and has recommended it to the publishers of medical textbooks and to practicing physicians. The method offers hope of contributing in no small degree to the control of the infection. Already there are indications that it is being extensively employed by physicians, plantation owners, and the public in general.

IX

CONTROL OF YELLOW FEVER

The operations for freeing Guayaquil, Ecuador, from yellow fever, which were begun on November 25, 1918, were continued throughout 1919. Preceding the inauguration of these measures a Yellow Fever Commission visited Guayaquil, and during a stay of two months made an intensive study of the disease and of the sanitary conditions under which it had persisted. Dr. Hideyo Noguchi, a member of the commission, conducted a series of laboratory investigations in the course of which he succeeded in isolating an organism which is apparently the causative agent of yellow fever. The curative serum and the immunizing vaccine which he prepared as a result of his Guayaquil work were used during 1919, and gave indications of developing into important agents for the cure as well as the prevention of the disease.

Control Measures Pursued in Guayaquil. Aside from the isolation, behind metallic screening, of all suspicious cases indicative of yellow fever, the chief feature of the control program put into effect in 1918 and 1919 was the prevention of *Stegomyia* propagation by the covering of tanks; by drainage, ditching, and oiling; and by the use of fish to devour mosquito larvae in water barrels and miscellaneous small containers. In the carrying out of the work the city was divided into districts of such size as to permit weekly house-to-house inspection by the sanitary squads. Fig. 68 shows the division of the city into working districts at the period of greatest expansion. Government authorities and the people entered heartily into the control efforts, and gave the measures their warmest support throughout the entire course of operations.

Success of Control Work in Guayaquil. The average number of cases of yellow fever in Guayaquil annually during the period from 1912 to 1918 was 259. During 1918 there were 460 cases. The statistics for 1919 show a record of 150 cases for the period from January to May, and an entire absence of cases during the remainder of the year. Fig. 9, page 89, gives a record of the monthly incidence of the infection during 1918 and 1919. The disease appears to have been brought under control, but it is proposed to continue active operations, with a reduced personnel, throughout the year 1920. As a final safeguard against the recrudescence of the disease, the entire region will be kept under observation for at least a year after the disappearance of the last evidence of the infection.

YELLOW FEVER IN CENTRAL AND SOUTH AMERICA

Outbreaks of yellow fever were reported during 1919 from Peru and Brazil in South America, from Honduras, Salvador, and Nicaragua in Central America, and from Mexico. In the Canal Zone one case of the disease was detected upon a vessel in quarantine, in a person who had recently come from Nicaragua. This was isolated and no further cases occurred. In the opinion of competent authority, ports which control the breeding of *Stegomyia* mosquitoes are in no danger even if a case of yellow fever is introduced.



Fig. 68.—Map of Guayaquil, Ecuador, showing division of city into working districts, at period of greatest expansion. Each spot indicates a case of yellow fever. Note concentration of cases near center of city where water tanks are most numerous

The 1918 Outbreak in Guatemala. The report for 1918 told of an epidemic of yellow fever which had developed in Guatemala in June of that year, and had involved seventeen small communities, most of them on or near the west coast. The infection had been introduced into Guatemala from Tapachula, Mexico. Investigation indicated that the disease had spread from its endemic focus in Merida, Yucatan, and had reached Tapachula either by an overland or coastwise route by way of Puerto Mexico, thence proceeding along the route of the railroad (see map, Fig. 69). The total incidence of the disease in the seventeen communities was over 550, with a death rate of approximately 36 per cent.

Bringing Under Control the Guatemalan Outbreak of 1918. Operations for freeing Guatemala from yellow fever were inaugurated in July, 1918, under the immediate direction of Dr. Joseph H. White. Quarantine was established and maintained, a system of daily house-to-house inspections was instituted in each community, suspected cases were isolated, and measures were carried out for the destruction or control of the breeding places of the *Stegomyia*



Fig. 69.—Epidemic route of yellow fever in Central America, 1918–1919. Broken lines indicate probable route of infection from Merida, Yucatan, into Guatemala. Solid line connects points visited by yellow fever in Central America

mosquito. The last case occurred in December, 1918. Protective work was carried on by Government throughout the year 1919 in Pacific coast towns and in communities on or near the Mexican border, and there was no recurrence of the outbreak during the year.

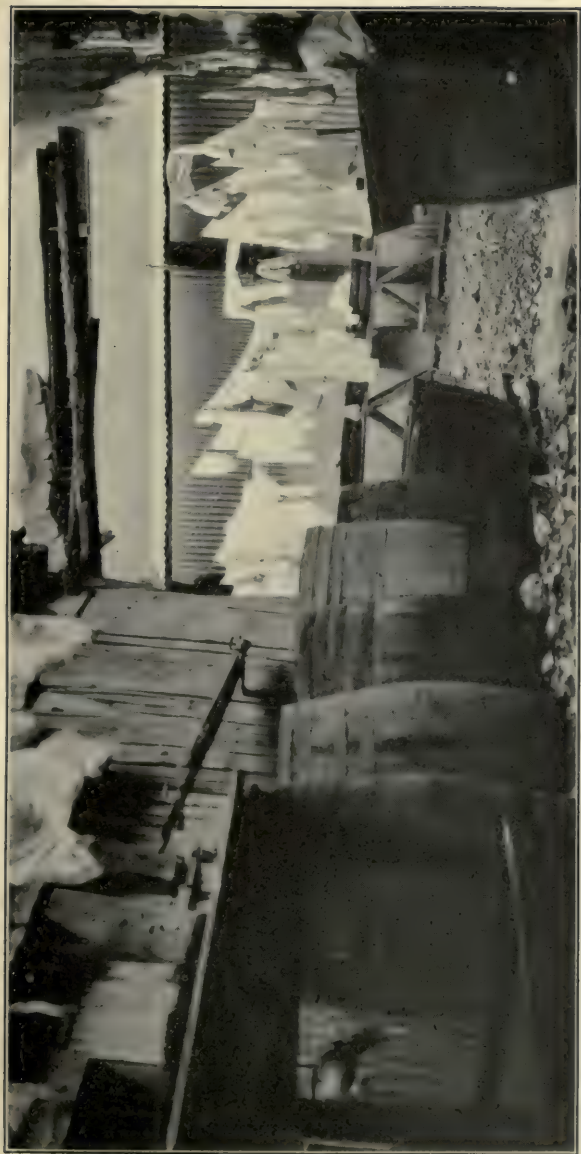


Fig. 70.—Patio in tenement house district of Guayaquil, near center of city. Note large numbers of water containers. In nearly all of these, before control measures, yellow fever mosquitoes were breeding



Fig. 71.—Typical patio in outskirts of city of Guayaquil, Ecuador. The sanitary inspector (in uniform) is straining water through muslin to discover whether mosquitoes are breeding

Course of the Disease in Central America during 1919.

Yellow fever was first detected in Central America during 1919 at Amapala (Fig. 69). Thence it spread to San Salvador and to Nicaragua. In the former republic thirty positive and ten suspicious cases of the disease were reported in San Salvador city; ten positive and several suspicious cases in San Miguel; and one case in La Unión. There were also reports of suspicious cases in other towns, as Quetzaltepeque, San Vivil, and Guayabal, but on investigation the rumors could not be verified. About 50 per cent of the bona fide cases died. In December a case of yellow fever in the person of an American who had come directly from Salvador, was detected at the New Orleans quarantine station.

In Nicaragua the disease first appeared in León about the middle of July, and a little later in Managua. The outbreak in this country has been attributed to refugees from the Hondurian revolution. There were about 100 cases in León up to October 26, counting as positive all typical and highly suspicious cases. The cases up to August 10 were confined almost entirely to people from Matagalpa and the Segovias; until then, none of the cases at Leon had occurred among natives of that place.

In the latter part of August, Dr. C. A. Bailey, the Board's representative in Salvador, accompanied General Lyster and Dr. Pareja, two members of the Board's Yellow Fever Commission, on a visit of investigation to Amapala, Honduras. On arrival there the commission was informed that three persons had recently died with symptoms closely resembling those of yellow fever. On board the U. S. S. Chicago, at that time lying at anchor in the harbor, there were two positive cases in the early stages of the disease, both of which had undoubtedly received their infection while on shore leave in Amapala. Reports of suspicious cases had also been received from San Lorenzo, Pespore, and Choluteca. The last-named place could not be visited because of a revolution, but the commission on its visits to San Lorenzo and Pespore found no yellow fever in either place. In both, the Stegomyia index was low. The commission saw, between August 30 and September 6, the respective dates of its arrival at and departure from Amapala, a total of seven positive and several suspicious cases. There was one death. These cases were in addition to the three which were reported as having died, with typical symptoms, before the commission's arrival.

Creation of Yellow Fever Boards in Central America. The National Health Departments of Salvador, Nicaragua, and Honduras invited the Board's representatives to join with them in efforts to control the disease. As a result, sanitary inspection corps were organized and active campaigns against the Stegomyia mosquito were instituted in localities which either had been visited by yellow fever, or were in danger of being visited. The people co-operated heartily in the programs, and the outbreaks were quickly suppressed. The

last case was reported from Honduras in September, from Nicaragua in November, and from Salvador in December. Permanent local yellow fever boards have been organized in all these countries, as well as in Guatemala, and protective anti-mosquito measures are being continued under the supervision of commissions on which the International Health Board has representatives.

Recurrence of Yellow Fever in Brazil. During the first quarter of the year, yellow fever appeared in six of the northern states of Brazil. Reports from the state of Bahia, whose principal city is believed to be an endemic stronghold of the disease, indicated that there were many cases in that city during the year. In May and June two cases were discovered as far south as the city of Rio de

Janeiro, both in persons who had recently arrived there from Bahia. Five cases were reported from Rio Grande do Norte during the year, two from Sergipe, five from Pernambuco, and an indeterminate number from Ceara (see map, Fig. 72).



Fig. 72.—Map of Brazil indicating, by cross hatching, states visited by yellow fever during 1919

Results of Control Measures Instituted by Brazilian Authorities.

Operations against yellow fever were centralized under the newly reorganized Brazilian national public health service, and vigorous campaigns were instituted in all the northern localities in which the disease was suspected of

being endemic. At the close of the year the infection seemed to be confined, in endemic form, to the coastal area between Bahia and Pernambuco. The last case was reported from Ceara in June, from Sergipe in August, from Rio Grande do Norte in September, from Pernambuco in October, and from Bahia in November. The work throughout the region was well in hand at the close of the year, and prospects appeared bright for the early, complete, and final elimination of the infection.

Appearance of the Disease in Peru. The frequent intercourse between Guayaquil (in Ecuador) and Piura, a city of 30,000 inhabitants in northern Peru, doubtless occasioned the mild epidemic of yellow fever which appeared in the latter region during the first half

of 1919. Up to the middle of July there had been thirty cases with ten deaths. In addition to Piura, the port of Payta was affected. The newly created health service of Peru has undertaken control measures, and at the close of the year was prosecuting a vigorous anti-Stegomyia campaign.¹

Recrudescence of Yellow Fever in Mexico. Yellow fever in epidemic form had not been reported from Mexico for some years. In 1919, it was reported in the state of Yucatan, where in November it caused the death of two persons. The disease assumed epidemic tendencies and spread to the states of Campeche and Chiapas. Later a number of cases were reported from Manzanillo on the Pacific coast. The Mexican authorities notified the health officials of other countries of the presence of the disease, so that the latter might establish a protective quarantine.

¹Later, May, 1920: Since February, 1920, yellow fever has occurred in at least ten places, with more than 250 cases reported. Work for the control of the infection continues in progress throughout the infected region.

X

PREVENTION OF TUBERCULOSIS IN FRANCE

The work of the Commission for the Prevention of Tuberculosis in France is carried out under four main departments: the medical department, which operates model dispensaries for the demonstration of working methods; the department of extension, which organizes and equips dispensaries in various provinces of the country; the department of nursing, which maintains training schools for public health visitors, and sends out these visitors to meet the ever-increasing demands of public health work; and the department of education, which organizes exhibitions, holds mass meetings, and distributes public health literature throughout France. The main activities of each of these departments during 1919 are summarized below.

WORK OF THE MEDICAL DIVISION

Under the direction of the medical division, the demonstration units in the 19th arrondissement of Paris and in the department of Eure-et-Loir were continued and developed; the work of dispensary organization was begun in three departments of the war-devastated area—Aisne, Marne, and Meurthe-et-Moselle; surveys were conducted in portions of five other departments; laboratory service in Paris and in Eure-et-Loir was centralized; and a graduate course in the theory and practice of treating tuberculosis was organized in co-operation with the Paris Faculty of Medicine and the physicians of the Paris hospitals.

Progress in the Department of Eure-et-Loir. During 1919 there were twenty-two dispensaries in operation in the department of Eure-et-Loir, eleven of which were opened after July 1. By the end of the year, two pavilions for advanced cases of tuberculosis were operating satisfactorily, and work was progressing on two additional pavilions and on a building which was being remodeled to serve as a sanatorium. With the opening of the three latter buildings, and of the two new dispensaries which are to be completed in January, 1920, the program adopted for the department will be practically in full operation.

Developments in the 19th Arrondissement of Paris. The important developments in the 19th arrondissement of Paris were the centralization of dispensary work at two dispensaries—the large new central dispensary, and a smaller one in another part of the arrondissement—and the appointment of a French physician as chief of dispensaries. The French physician succeeds an American. This change is in keeping with the established policy of replacing,



Fig. 73.—One of the posters used for creating interest in public health work in France



Fig. 74.—Taking health messages to the schoolchildren of France

as soon as practicable, the American with French personnel. The staff of the Commission's medical service in the arrondissement is now entirely French.

Graduate Course for Physicians. A six weeks' training course in the diagnosis and treatment of tuberculosis, open to graduate physicians, was inaugurated on October 20 at the Faculty of Medicine in Paris. In addition to theoretical instruction, the course included practical work under specially qualified experts in hospitals and dispensaries. Twenty-eight physicians took advantage of the course during 1919. The Commission provided sixteen of these with full, and six with partial, scholarships. A similar course is to be given in April, 1920. Registration for this course is already in excess of the number of pupils that can be accommodated.

DEPARTMENT OF NURSING

During 1919, seven training schools for public health visitors were in active operation. All of these were under French direction, and all had teaching staffs almost wholly French. Altogether, 205 scholarships were granted in these schools, and fifty-one pupils were graduated. Through this department the Commission assigned seventy-six visiting nurses to various departments of France. The salaries of these nurses, at first paid by the Commission, are gradually being assumed by the local department authorities. At present these authorities are paying the full salaries of eighteen nurses, and portions of the salaries of nine others.

DEPARTMENT OF EDUCATION

The department of education continued its traveling exhibits, its distribution of literature, and its publicity in newspapers and magazines. By the end of the year the exhibits had visited twenty-eight departments of France. In each department large meetings were held at all the important centers; addresses were made by local authorities, by prominent physicians, and by the Commission's lecturers; films giving scientific and popular instruction in tuberculosis were shown; and literature was distributed to each member of the audience. Simple popular talks were also delivered to each class in all the schools in the cities visited. Punch and Judy shows with hygiene as their subject proved a popular feature of the propaganda work, and were particularly valuable in enlisting the interest of the children. In all, more than three million people were reached by the educational activities and more than three million pieces of literature were distributed.

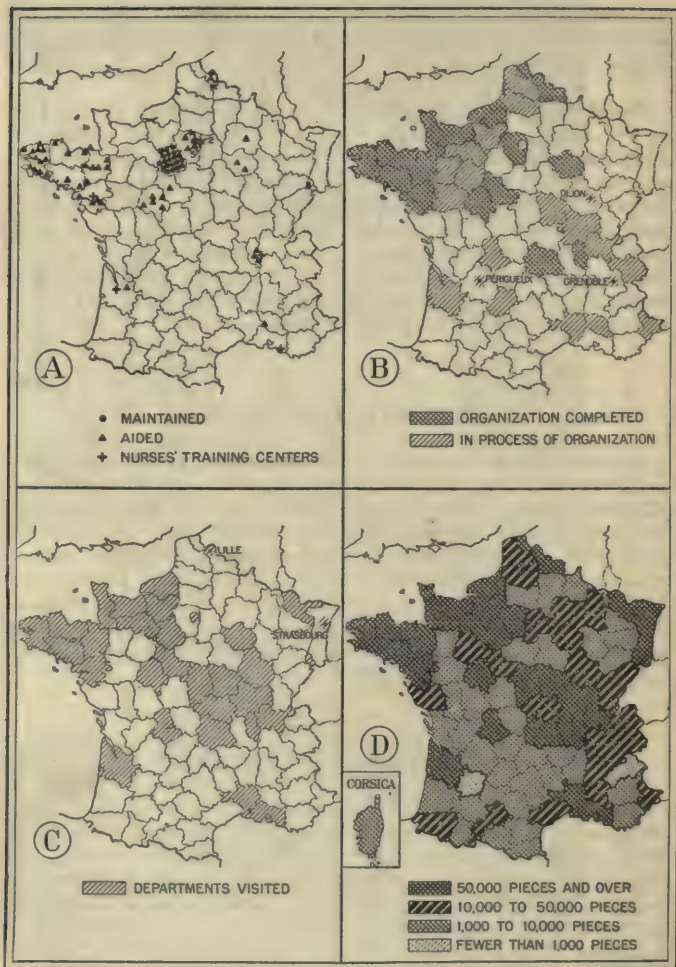


Fig. 75.—Organization and activities of Commission for the Prevention of Tuberculosis in France. A. Work of medical division and department of nursing, showing dispensaries maintained or aided and location of nurses' training centers; B. Work of division of departmental organization, showing departments in which anti-tuberculosis organization has been effected; C. and D. Work of educational division, C. showing departments visited by traveling exhibits and D. the number of pieces of literature distributed in each department.

DEPARTMENT OF EXTENSION

The efforts of the Department of Extension resulted in the organization, in fourteen departments of the country, of departmental committees for the control of tuberculosis. Preliminary work toward this end has been pushed forward in twelve additional departments. As one result of the work of the Department of Extension, forty-two new dispensaries were opened during 1919, thirty-six others were in process of construction at the close of the year, and plans were being perfected for fifty-two more.

SUMMARY OF WORK ACCOMPLISHED IN 1919

- 33 departments surveyed and organized.
- 14 departments organized during the year.
- 21 departmental tuberculosis associations formed.
- 75 new local tuberculosis committees formed.
- 48 local tuberculosis committees being formed.
- 56 new dispensaries opened in 1919, outside of Eure-et-Loir.
- 58 new dispensaries are in process of installation.
- 50 new dispensaries are immediately planned for.
- 60 new health visitors in the field, of which 35 are for dispensaries co-operating with the Commission.
- 1,866,200 Francs donated by the American Red Cross and the Rockefeller Commission for certain departments.
- 4,162,000 Francs raised and voted by the French in these same departments.

TABULAR SUMMARY

TABLE 3: *All Countries—Persons Enumerated in Census, Microscopically Examined, Found Infected, Given First Treatment, and Cured of Hookworm Disease in Areas Completed During 1919, by Geographical Regions. Figures Excluded for Areas in Which Work Was Still in Progress*

GEOGRAPHICAL REGION	CENSUS Number	MICRO- SCOPICALLY EXAMINED		FOUND INFECTED		GIVEN FIRST TREATMENT		CURED	
		Number	Per Cent	Number	Per Cent	Number	Per Cent	Number	Per Cent
Total . . . . .	..	..	..	..	..	237,434	..	130,236	54.9
Southern States ¹ . . . . .	..	26,226	..	10,255	39.1	9,380	91.5	225	2.4
West Indies	20,637	20,350	98.6	14,537	71.4	13,534	93.1	10,347	76.5
Central America ² . . . . .	..	175,201	..	98,857	56.4	86,079	87.1	43,151	50.1
South America (Brazil)	54,387	48,989	90.1	30,387	62.0	26,751	88.0	..	..
The East ³ . . . . .	..	..	..	..	..	101,690	..	76,513	75.2

¹ During 1919, in the Southern States, the main emphasis was placed on the building and improving of latrines.

² In Central America the bulk of the work is by the dispensary plan. This does not afford opportunity for frequent re-examinations to determine cure. Consequently the percentage of persons known to be cured is low in comparison with other regions.

³ In Ceylon, throughout 1919, estate laborers were assumed to be infected, and accordingly were given first treatment without preliminary microscopic diagnosis. This explains the blank spaces for "Census," "Microscopically Examined," and "Found Infected" in the lines for "The East" and "Total."

TABLE 4: Southern States—Persons Enumerated in Census, Microscopically Examined, Found Infected, Given First Treatment, and Cured of Hookworm Disease in Areas Completed During 1919, by States. Figures Excluded for Areas in Which Work Was Still in Progress¹

STATE	CENSUS	EXAMINED		INFECTED		TREATED		CURED	
		Number	Per Cent	Number	Per Cent	Number	Per Cent	Number	Per Cent
Total	..	26,226	..	10,255	39.1	9,380	91.5	225	2.4
Alabama	..	46	..	6	13.0	6	100.0	6	100.0
Georgia	38,911	1,518	3.9	373	24.6	336	90.1	107	31.8
Mississippi	27,510	16,036	58.3	8,479	52.9	8,471	99.9	6	..
South Carolina	..	4,966	..	1,057	21.3	327	30.9	..	..
Tennessee	8,857	378	4.3	17	4.5	9	52.9	3	33.3
Texas	4,573	3,044	66.6	322	10.6	230	71.4	103	44.8
Virginia	2,881	238	8.3	1	0.4	1	100.0	0	0.0

¹ During 1919, in the Southern States, the main emphasis was placed on the building and improving of latrines.

.. Less than one-tenth of one per cent.

TABLE 5: *West Indies—Persons Enumerated in Census, Microscopically Examined, Found Infected, Given First Treatment, and Cured of Hookworm Disease in Areas Completed During 1919, by Countries. Figures Excluded for Areas in Which Work Was Still in Progress*

COUNTRY	CENSUS	MICRO-SCOPICALLY EXAMINED		FOUND INFECTED		GIVEN FIRST TREATMENT		CURED	
	Number	Number	Per Cent	Number	Per Cent	Number	Per Cent	Number	Per Cent
Total	20,637	20,350	98.6	14,537	71.4	13,534	93.1	10,347	76.5
British Guiana	4,079	3,991	97.8	2,895	72.5	2,659	91.8	1,757	66.1
Jamaica	2,935	2,842	96.8	1,552	54.6	1,346	86.7	1,058	78.6
Saint Lucia	4,366	4,350	99.6	2,597	59.7	2,547	98.1	2,364	92.8
Trinidad	9,257	9,167	99.0	7,493	81.7	6,982	93.2	5,168	74.0

TABLE 6: *Central America—Persons Enumerated in Census, Microscopically Examined, Found Infected, Given First Treatment, and Cured of Hookworm Disease in Areas Completed During 1919, by Countries. Figures Excluded for Areas in Which Work Was Still in Progress*

COUNTRY	CENSUS Number	MICRO- SCOPICALLY EXAMINED		FOUND INFECTED		GIVEN FIRST TREATMENT		CURED ¹	
		Number	Per Cent	Number	Per Cent	Number	Per Cent	Number	Per Cent
Total	..	175,201	..	98,857	56.4	86,079	87.1	43,151	50.1
Costa Rica	72,075	64,371	89.3	29,872	46.4	26,551	88.9	16,019	60.3
Guatemala	46,220	44,495	96.3	28,752	64.6	25,283	87.9	11,978	47.4
Nicaragua	..	12,246	..	5,820	47.5	4,829	83.0	1,443	29.9
Panama	18,384	15,307	83.3	13,490	88.1	11,812	87.6	5,927	50.2
Salvador	42,967	38,782	90.3	20,923	54.0	17,604	84.1	7,784	44.2

¹ In Central America the bulk of the work is by the dispensary plan. This does not afford opportunity for frequent re-examinations to determine cure. Consequently the percentage of persons known to be cured is low in comparison with that for other regions

TABLE 7: *The East—Persons Enumerated in Census, Microscopically Examined, Found Infected, Given First Treatment, and Cured of Hookworm Disease in Areas Completed During 1919, by Countries. Figures Excluded for Areas in Which Work Was Still in Progress*

COUNTRY	CENSUS	MICRO-SCOPICALLY EXAMINED		FOUND INFECTED		GIVEN FIRST TREATMENT		CURED	
	Number	Number	Per Cent	Number	Per Cent	Number	Per Cent	Number	Per Cent
Total	..	..	..	..	..	101,690	..	76,513	75.2
Ceylon ¹	..	..	..	..	..	88,602	..	69,032	77.9
China	2,025	2,025	100.0	937	46.3	848	..	1,359	..
Seychelles	10,824	10,801	99.8	6,924	64.1	6,702	96.8	6,122	91.3
Siam ²	..	..	..	..	..	5,538	..	..	..

¹ In Ceylon, throughout 1919, estate laborers were assumed to be infected, and accordingly were given first treatment without preliminary microscopic diagnosis. This explains the blank spaces for "Census," "Microscopically Examined," and "Found Infected" in the lines for "Ceylon" and "Total."

² First Quarter only.

FINANCIAL STATEMENT

FINANCIAL STATEMENT

The statement on the following pages shows that in the work of the International Health Board during the year 1919, a total of \$1,436,-355.00 was expended. This statement is based on expenditures actually made during the calendar year 1919, regardless of when financial reports were received at the New York office. It will be seen that the figures differ from those given in the Treasurer's statement on pages 345 to 406. The Treasurer's Report includes amounts paid in the field during the first three quarters of 1919, to which in many instances have been added amounts paid during the fourth quarter of 1918, but not recorded until early in 1919. This discrepancy between the two reports is caused by the necessity of closing the Treasurer's books shortly after the first of the calendar year, before detailed financial reports can be received from the foreign countries in which a large part of the work of the Board is conducted.

TABLE 8: *Expenditures of the International Health Board During the Year 1919*

FIELDS OF ACTIVITY		AMOUNT EXPENDED
Grand Total		\$1,436,355.00
RELIEF AND CONTROL OF HOOKWORM DISEASE		511,011.10
MALARIA CONTROL		34,965.08
YELLOW FEVER CONTROL		94,526.42
TUBERCULOSIS IN FRANCE		602,775.78
PUBLIC HEALTH EDUCATION		38,367.71
PHILIPPINE HOSPITAL SHIP		6,500.00
INVESTIGATION OF SEWAGE DISPOSAL AT RURAL HOMES		778.60
FIELD STAFF SALARIES, EXPENSES, AUTOMO- BILES, ETC., NOT PRORATED TO SPECIFIC BUDGETS		21,524.93
MISCELLANEOUS		47,598.71
ADMINISTRATION		78,306.67
ITEMIZATION BY STATES AND COUNTRIES		
RELIEF AND CONTROL OF HOOKWORM DISEASE .		511,011.10
Southern States		113,299.42
West Indies		48,457.24
Central America		111,684.19
South America		157,555.86
The East		80,014.39
Southern States		<u>\$113,299.42</u>
Administration		10,577.32
Alabama		5,283.74
Georgia		4,604.21
Kentucky		1,978.40
Louisiana		1,370.18
Maryland		2,264.25
Mississippi		15,773.21
North Carolina		13,924.04
South Carolina		14,754.86
Tennessee		10,201.59
Texas		22,380.20
Virginia		10,012.42
West Virginia		175.00
West Indies		<u>48,457.24</u>
Administration		4,624.50
British Guiana*		9,984.28
Dutch Guiana*		613.23
Jamaica		9,832.48
St. Lucia		8,109.32
Trinidad		15,293.43

*For administration reasons, British and Dutch Guiana, although on the mainland of South America, are considered West Indian Colonies.

TABLE 8: *Expenditures of the International Health Board During the Year 1919—Continued*

FIELDS OF ACTIVITY	AMOUNT EXPENDED
RELIEF AND CONTROL OF HOOKWORM DISEASE— <i>Continued</i>	
Central America	\$111,684.19
Administration	9,785.86
Costa Rica	20,492.01
Guatemala	19,514.73
Nicaragua	26,164.44
Panama	18,565.05
Salvador	17,162.10
South America	157,555.86
Brazil	155,430.38
Colombia	2,125.48
The East	80,014.39
Administration	3,619.43
Australia	15,902.95
Ceylon	32,497.87
China	12,187.58
Seychelles Islands	8,291.90
Siam	7,514.66
MALARIA CONTROL	\$34,965.08
Arkansas	13,505.66
Mississippi	21,167.37
Brazil	292.05
YELLOW FEVER CONTROL	94,526.42
Ecuador	48,396.77
Guatemala	967.82
Salvador	890.71
Salaries, Expenses, Equipment, etc. of Director and Associates	44,271.12
TUBERCULOSIS IN FRANCE	602,775.78
Central Administration	72,394.12
Medical Division	389,328.32
Educational Division	141,053.34
PUBLIC HEALTH EDUCATION	38,367.71
Department of Hygiene—Faculdade de Medi- cina e Cirurgia de São Paulo:	
Equipment	\$ 1,734.95
Operating Expenses	21,847.62
	23,582.57

TABLE 8: *Expenditures of the International Health Board During the Year 1919—Continued*

FIELDS OF ACTIVITY	AMOUNT EXPENDED
PUBLIC HEALTH EDUCATION— <i>Continued</i>	
Fellowships:	
Bello Horizonte Medical School	\$2,461.65
Czecho-Slovakian	2,858.66
Public Health	2,420.69
São Paulo—Department of Hygiene	3,020.89
Miscellaneous	2,356.58
University of Pennsylvania	\$13,118.47
	1,666.67
MISCELLANEOUS	47,598.71
Analysis of Records of the United States Army in respect to Hookworm disease	43.95
Drugs for conserving Health of Field Staff	76.94
Medical Examination of Applicants of Field Staff	100.00
Field Equipment and Supplies	23,434.94
Surveys and Exhibits	16,870.71
Survey—Public Health Administration in Mass.	26.09
Pamphlets and Charts	5,499.50
Portable House for Salvador	476.19
Express, Freight and Exchange	1,070.39

255-

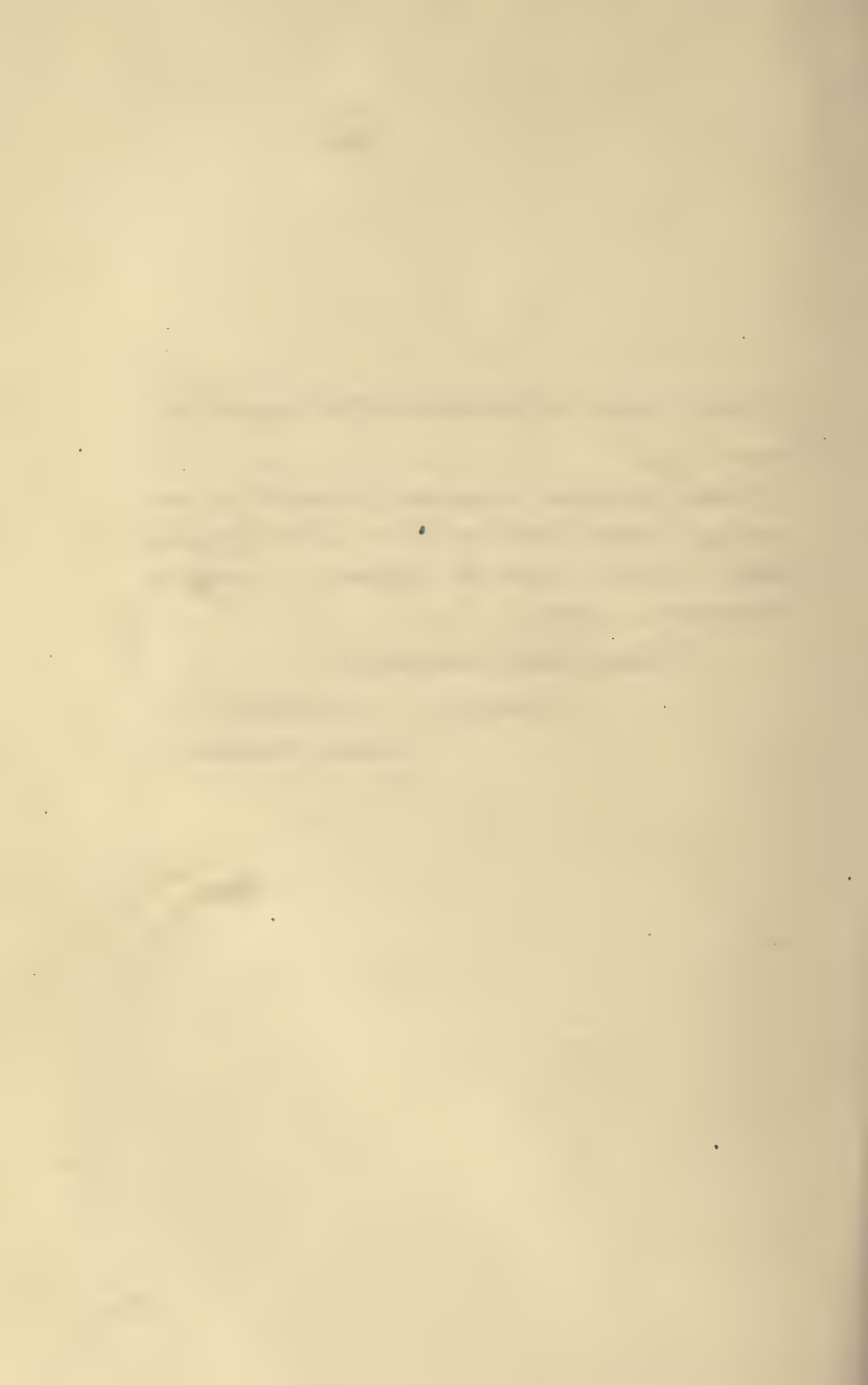
CHINA MEDICAL BOARD
Report of the General Director

To the President of the Rockefeller Foundation:
Sir:—

I have the honor to submit herewith my report as General Director of the China Medical Board for the period of January 1, 1919, to December 31, 1919.

Respectfully submitted,

GEORGE E. VINCENT,
General Director.



CHINA MEDICAL BOARD

The republic of China covers an area of approximately 4,300,000 square miles. Its climate ranges from that of the tropics to that of the north temperate zone. The population is reported to be 400,000,000, about one sixth of the total for the globe. No definite statistics are available on this point, but any number from 250,000,000 to 600,000,000 has been estimated. The most conservative authorities believe that 400,000,000 is a fairly correct figure. For this large country with its dense population, widely varied climate, intense poverty, and many diseases, there are very few doctors and still fewer medical institutions.

The central government and provincial governments maintain several medical schools, usually with Japanese trained teachers. The Japanese schools in turn have looked to Germany for their medical inspiration. Usually the Chinese and Japanese teachers in these medical schools have not been trained in the best Japanese schools. The various missionary societies of America and Europe have made valuable contributions to medical learning in

China. Through hospitals, large and small, through widely scattered dispensaries, and through a few medical schools, they are bringing to the door of China the learning of the western world.

European and American physicians in Treaty Ports, a British medical school in Hongkong, a Japanese medical school in Moukden, and various hospitals locally organized and supported have had an educative effect on public opinion. Two organizations, the Chinese National Medical Association and the China Missionary Association, have done much to bring together the various forces for medical progress and to standardize the ethics and methods of the profession. There is still, however, an acute need in China for well trained native practitioners and nurses, and for thoroughly equipped and adequately staffed hospitals.

It is the purpose and hope of the China Medical Board to co-operate with the various existing agencies in the gradual and orderly development of a system of scientific medicine in China. It is believed that the following are the necessary steps toward this ideal:

1. Pre-medical education.
2. Undergraduate courses for physicians.
3. Graduate study for investigators, laboratory workers, teachers, and clinical specialists.



Fig. 76.—First year class in the Pre-Medical Department of the Peking Union Medical College

4. Short courses for private practitioners and missionary doctors, both foreign and Chinese.
5. Medical research, especially with reference to the problems peculiar to the Far East.
6. Standardized hospitals as training centers for internes, as models for imitation by the Chinese, as headquarters for practicing physicians, and as a means of popular education.
7. Organized efforts to diffuse among the Chinese a knowledge of modern medicine and public health.
8. The fostering of professional ethics through the development of character and idealism.

The work of the China Medical Board is still in its infancy. While the Board's accomplishments are small in comparison with the vast field it has entered, it feels encouraged by the stimulation of missionary enterprise which it believes has resulted in part from its entrance into the field, and by the growing interest which the Chinese, due to the various agencies at work, are taking in western medicine. As its own special contribution to the cause of medicine in China, the wholly reorganized and greatly enlarged Peking Union Medical College has been opened. Pre-medical work began in 1917 and the first medical classes in the autumn of 1919. The reopening of the medical course

in Peking marks a new period in the work of the China Medical Board. This seems to be an appropriate time to review the past five years of the Board's activity. The Resident Director has prepared such a report, which appears on pages 305 to 343. A statement of the progress of the past year is presented in the following pages.

I. MEDICAL EDUCATION

A. The Peking Union Medical College

The attention of the China Medical Board for the past three or four years has been focused on the development of the Peking Union Medical College. The school was built, equipped and is maintained with funds supplied by the Rockefeller Foundation through the China Medical Board. The management is in the hands of a Board of Trustees composed of seven persons chosen by the China Medical Board, and one by each of the six missionary societies which supported the former school. During the year 1919 the personnel of the Board of Trustees was as shown on page 266. Administration of details was vested during the year in the Local Administrative Board, which represented the different departments of the school. The composition of this Board is shown on page 267.

Construction, equipment, and the selection of a faculty have occupied the time and attention of the officers during the year. The pre-medical school has continued its work. In October, 1919, a first year class entered the medical school and began regular studies.

BOARD OF TRUSTEES, PEKING UNION MEDICAL
COLLEGE (IN NEW YORK)

Chairman

JOHN R. MOTT

Vice-Chairman

ARTHUR J. BROWN

Secretary

EDWIN R. EMBREE

Executive Committee

George E. Vincent, *Chairman*

Arthur J. Brown
Wallace Buttrick

Simon Flexner
Frank Mason North

Members

To serve until the Annual Meeting of 1922

F. H. Hawkins
Paul Monroe

Frank Mason North
William H. Welch

To serve until the Annual Meeting of 1921

J. Auriol Armitage
James L. Barton

Simon Flexner
Robert H. Kirk

John R. Mott

To serve until the Annual Meeting of 1920

Arthur J. Brown
Wallace Buttrick

James Christie Reid
George E. Vincent

These members have been elected as follows:

By the Rockefeller Foundation

Wallace Buttrick
Simon Flexner
Robert H. Kirk

John R. Mott
Paul Monroe
George E. Vincent

William H. Welch

By the London Missionary Society

F. H. Hawkins

By the Medical Missionary Association of London

James Christie Reid

By the American Board of Commissioners for Foreign Missions
James L. Barton

By the Society for the Propagation of the Gospel in Foreign Parts
J. Auriol Armitage

By the Board of Foreign Missions of the Methodist Episcopal Church
Frank Mason North

By the Board of Foreign Missions of the Presbyterian Church in the United States of America
Arthur J. Brown

ADMINISTRATIVE BOARD, PEKING UNION MEDICAL COLLEGE (IN PEKING)

Chairman

HENRY S. HOUGHTON, *ex-officio*

Vice-Chairman

ROGER S. GREENE

Secretary

A. M. DUNLAP

Executive Committee

Henry S. Houghton, Chairman, <i>ex-officio</i>	
Roger S. Greene, <i>ex-officio</i>	Donald E. Baxter, <i>ex-officio</i>
Edmund V. Cowdry	William Warren Stifler

Members, ex-officio

Donald E. Baxter	Harvey J. Howard
Edmund V. Cowdry	John H. Korn
Albert M. Dunlap	Bernard E. Read
Roger S. Greene	W. W. Stifler
Henry S. Houghton	Philip Allen Swartz
	Anna Dryden Wolf

PLANT. The nucleus of the plant of the Peking Union Medical College is formed by the group of buildings which belonged to the original missionary school. The pre-medical school is now housed in the laboratories and classrooms of the old buildings; the men's hospital is still in use; and the residence compounds have been taken over and additional houses built. The new buildings for the medical school occupy, in the heart of the city, a large tract which was formerly the site of the palace of a Manchu prince. A few plots of land adjacent to the property already owned have been purchased during the past year.

In the architectural scheme of the new buildings, Mr. Harry Hussey, the designer, has attempted to combine both Chinese and American forms. The inside of the buildings is very much what would be found in a first class medical school in the States; the outside is almost wholly Chinese. The construction is of gray brick with jade green, glazed-tiled roofs, and scarlet pillars. Under the eaves and around all porticoes and entrances there are decorations in Chinese design, beautifully executed by Chinese artisans, in red, blue, green, and gold. The effect is striking. Already, even before the completion of construction, the



Fig. 77.—Unit of the Peking Union Medical College, showing general type of architecture

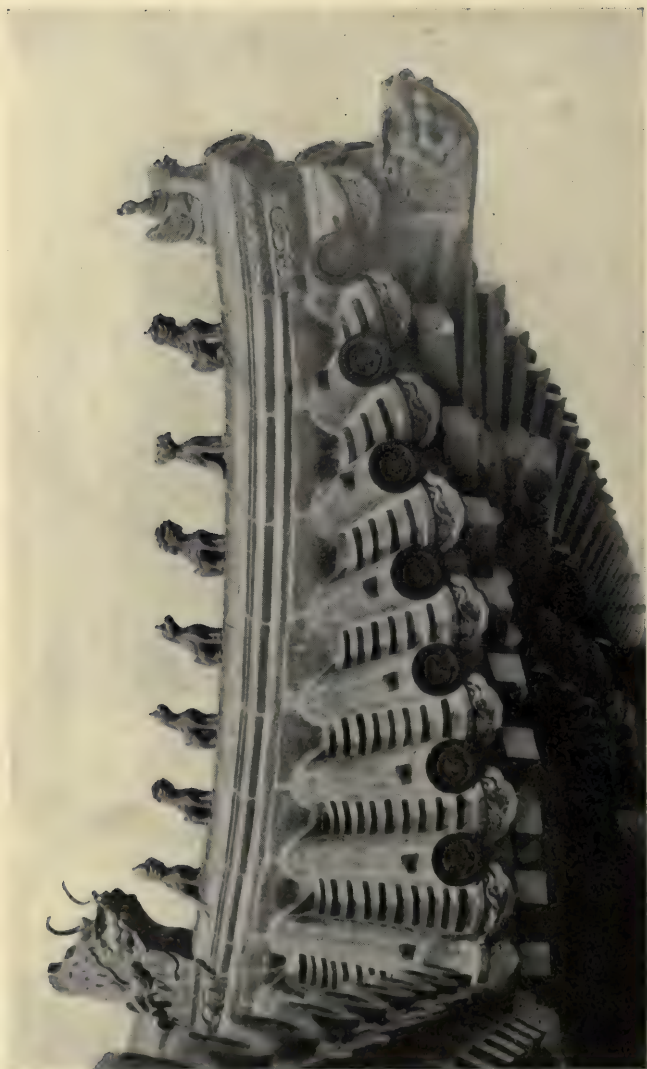


Fig. 78.—Detail of the roofs of the Peking Union Medical College

group forms a landmark in Peking; the Chinese call it "The Green City."

The completed plant will include laboratories for anatomy, physiology, and chemistry; a pathology building; a 250-bed hospital with provision for about thirty private rooms; a large out-patient department; a hospital administration unit with quarters for resident physicians and internes; a nurses' home; an animal house; and plants to supply water, heat, electric light, power, and fuel gas. The medical school group—anatomy, physiology, and chemistry—was opened in the fall of 1919. It is hoped that the entire plant may be completed early in 1921.

The faculty residences are grouped in two walled compounds five or ten minutes walk from the medical school. They are of brick and concrete with slate roofs, and contain all the conveniences of western life. The fourteen new residences in the south compound, adjacent to the original men's hospital, were completed in September and October. Those in the north compound (on land formerly belonging to the London Mission) will probably be finished in time to be occupied in the early autumn of 1920.

Many difficulties have been encountered in construction. Owing to the war, materials and scientific equipment have been hard to

secure; export and transportation embargoes have caused embarrassing delays; prices have increased; and the adverse rate of exchange has practically doubled the cost of the work. The present estimate of the total cost of buildings, equipment, and land is almost seven million dollars in gold.

Besides the large staff of western trained engineers, artisans, draftsmen, and mechanics, nearly three thousand coolies have been employed. Supervision has been vested in the following persons:

Henry S. Houghton, M.D., *acting director*

Coolidge and Shattuck, *consulting architects*, Boston

Henry Adams, *consulting engineer*, Baltimore

Donald E. Baxter, M.D., *superintendent of Peking Union Medical College*, New York and Peking

B. Frank Bennett, *chief of construction force*, Peking

Robert R. Kendall, *architect*, Peking

Charles E. Lane, *architect*, Peking

Dr. Houghton has devoted the major part of his time to directing the construction work. The purchase of scientific equipment has gone forward under Dr. Donald E. Baxter, who, for that purpose, has spent part of the year in the home office.

The purchase of books for the library is another branch of the work that has been delayed on account of the war. During 1919, however, it was possible to negotiate with book

dealers in France and Germany. Late in the year arrangements were made for Mr. James F. Ballard, assistant librarian of the Boston Medical Library, to go abroad to secure books and sets of periodicals for the college. A full and adequate scientific library is more important in Peking than it would be for a similar school in the United States, because in China there are no other complete libraries available for the use of the staff. A total of \$65,000 has thus far been appropriated for the library. It seems probable that an even larger amount will be required if Mr. Ballard succeeds in finding in European markets the additional books and periodicals that are desired.

WORK OF THE SCHOOL: *Teaching.* The medical school opened in the fall of 1919 in three completed new buildings—anatomy, physiology, and chemistry. Seven students were registered, most of whom were graduates of the Peking pre-medical school. Nineteen graduate students were also registered all of whom have carried specialized programs under the direction of the department heads.

Doctors Cowdry and Black, of the department of anatomy, and Dr. Bernard E. Read, associate professor of physiological chemistry, began undergraduate teaching in their subjects. In-

struction is in English; and proficiency in English, as well as a knowledge of Chinese, is a requirement for admission.

No women have as yet applied for admission to the medical school. If any do apply, however, they will be admitted on the same basis as are men. There are two women in the first class of the pre-medical school.

Short summer courses are planned for medical missionaries and for other doctors who desire to spend their vacation periods in keeping abreast of scientific medical progress. This opportunity for association with others who, like themselves, are deeply interested in medicine and public health, should be of inestimable value to missionaries who spend their lives in small hospitals and in isolated communities.

Research. Doctors Cowdry and Black, of the department of anatomy, have been active in the promotion of anatomical and anthropological research. They plan a small museum, and Dr. Cowdry has made an appeal for human embryos to be used in a detailed study of the relative growth of Chinese foetuses. Dr. Black has formed connections with others in China who are interested in anthropology, and has arranged to be kept informed about possible opportunities for research.

Dr. Bernard E. Read has been working on factors which control the food supply of China, and on certain studies in comparative physiology. The department of ophthalmology, of which Dr. Harvey J. Howard is the head, has been formulating interesting tests for Chinese aviators. A number of papers have been published by various members of the staff.

Hospital. Pending the completion, early in 1921, of the new general hospital, clinical work has been carried forward in the men's hospital. This building adjoins the south residence compound. Dr. Korn's has acted as superintendent.

During the year 1919 there have been many private cases. As a piece of community service, the staff undertook the medical examination of the servants of the school. Illustrated lectures were also given on general hygiene and the prophylaxis of disease. The working capacity of the hospital has been increased by providing equipped laboratories and technicians. The present is, of course, a transition period, and, with the opening of the new general hospital, many changes may be expected.

Nurses' training school. Miss Anna D. Wolf, assistant superintendent of the Johns Hopkins Hospital, was appointed superintendent of nurses of the Peking Union Medical College early in

1919. She sailed for Peking in July and was followed by twelve nurses, most of whom entered the language school. The beginning of the training school for Chinese nurses may precede the opening of the new hospital by a short period, but not much work will be undertaken in the new training school until the hospital is ready for use.

It is the hope of the Trustees that Chinese women nurses may be trained for all nursing work, including that of the men's wards. This is an innovation in China and one that will be undertaken slowly and cautiously. The candidates will be carefully selected, the course will be thorough and ample, constant supervision will be provided, and every effort will be made to foster a professional spirit and a sense of ethical responsibility. Pending the introduction of the new system in the men's hospital, Chinese male nurses are still being trained. It is uncertain how much longer this will be necessary.

Religious and social. The Rev. Philip A. Swartz has conducted, with energy and enthusiasm, the work of the religious and social department in the hospital and among the students. The department has arranged for religious meetings, addresses by the faculty, and chapel exercises, at which attendance is volun-

tary. Athletics and physical direction are also in the hands of Mr. Swartz. Successful efforts are being made to arouse, on the part of the Chinese students, an interest in sports and games.

The social service work, which it is planned to develop in connection with the hospital, has been assigned to the oversight of this department.

SPECIAL ARRANGEMENTS FOR SERVING THE FACULTY. For the convenience of those members of the faculty whose children are of school age, the Board has contributed to the support of the Peking American School. This is financed and managed by missionary societies, business houses, and individuals in Peking. It provides the only available educational opportunities for English speaking children in the city.

The learning of the Chinese language is necessary for some of the faculty; for many others it is interesting and important. The North China Language School in Peking, for the study of Chinese, was founded by various missionary organizations. The China Medical Board has recently made a contribution of \$40,000 toward a building for this school. An annual grant for current maintenance is also provided.

FACULTY. At the end of December, 1919, the following persons composed the faculty of the Peking Union Medical College:

THE MEDICAL SCHOOL

Franklin C. McLean, Ph.D., M.D., Professor, and head of the department of medicine, and director. University of Chicago, B.S., 1907, M.S., 1912, Ph.D., 1915. Rush Medical College, M.D., 1910. Assistant Resident Physician, Hospital of the Rockefeller Institute, 1914-1916.

Henry Spencer Houghton, Ph.B., M.D., Acting director. Ohio State University, Ph.B. Johns Hopkins Medical School, M.D. Formerly dean and professor of tropical medicine, Harvard Medical School of China.

Albert Menzo Dunlap, B.A., M.D., Associate professor of otology, rhinology, and laryngology, and dean. University of Illinois, B.A., 1906. Harvard Medical School, M.D. Formerly professor of otology, rhinology, and laryngology, and chief of out-patient department, Harvard Medical School of China.

Edmund V. Cowdry, Ph.D., Professor and head of the department of anatomy. University of Toronto, B.A., 1909. University of Chicago, Ph.D., 1912. Associate in anatomy, Johns Hopkins University, 1913-1917.

Ralph Garfield Mills, B.A., M.D., Professor and head of the department of pathology. University of Illinois, B.A., 1903. Northwestern Medical College, M.D., 1907. Formerly director of department of research, Severance Union Medical College, Seoul, Korea.

Adrian Stevenson Taylor, M.D., Professor and head of the department of surgery. Universities of Alabama and Virginia. University of Virginia, M.D., 1905. Formerly in charge of Southern Baptist Hospital, Langchow, China.

Harvey James Howard, M.A., M.D., D.Oph., Professor and head of the department of ophthalmology. University of Michigan, B.A., 1904. University of Pennsylvania, M.D., 1908. Formerly in charge of eye, ear, and nose department, Canton Christian College.

J. Preston Maxwell, B.S., M.D., L.R.C.P., F.R.C.S., Professor and head of the department of obstetrics and gynecology. London University, B.S., M.B., 1898, M.D., 1910. Formerly in charge of Yungchun Hospital, Fukien.

Davidson Black, B.A., M.D., Professor of embryology and neurology. University of Toronto, M.D., 1906, B.A., 1911. Formerly assistant professor of anatomy, Western Reserve Medical School.

Bernard E. Read, Ph.C., M.S., Associate professor of physiological chemistry. Yale University, M.S., 1918. Connected with the Union Medical College, Peking, 1909-1916.

Oswald H. Robertson, M.S., M.D., Associate professor of medicine. University of California, B.S., 1910, M.S., 1911. Harvard Medical School, M.D., 1915. Formerly assistant in pathology and bacteriology, Rockefeller Institute for Medical Research.

Andrew H. Woods, B.A., M.D., Associate professor of neurology and psychiatry. Washington and Lee University, B.A., 1893. University of Pennsylvania, M.D., 1898. Formerly connected with Canton Hospital and Canton Christian College.

Adolf Eduard Zucker, Ph.D., Instructor in modern European languages. University of Illinois, B.A., 1912, M.A., 1913. University of Pennsylvania, Ph.D., 1917. Formerly teacher of French and German, Tsing Hua College, Peking.

K. M. Ma, Hsiu-ts'ai, Instructor in Chinese. Formerly taught in preparatory department of Government University at Peking.

Hartley C. Embrey, M.S., Associate in physiological chemistry. University of Nashville, B.A., 1907. University of Chicago, M.S., 1915. Head of department of science, Central High School, Chattanooga, Tennessee, 1917-1918. Experimental work with DuPont Company, 1918-1919.

Ernest C. Faust, Ph.D., Associate in parasitology. Oberlin College, B.A., 1912. University of Illinois, M.A., 1914, Ph.D., 1917. Instructor in zoology, University of Illinois, 1917-1919.

En-Tseng Hsieh, M.D., D.P.H., Associate in pathology. Union Medical College, Peking, M.D., 1911. Harvard Medical School, D.P.H., 1917. Postgraduate work, University of Pennsylvania Medical School.

Edgar T. H. Tsen, M.D., Associate in pathology. Boone University, Wuchang, and Harvard Medical School of China. Postgraduate work at Harvard Medical School, Boston, and College of Physicians and Surgeons, Columbia University.

John H. Korns, M.A., M.D., Associate in medicine. Ohio Wesleyan University, B.A., 1904. Rush Medical College, M.D., 1909. Appointed to Union Medical College faculty under former management in 1915.

William G. Lennox, B.A., M.D., Associate in medicine. Colorado College, B.A., Harvard Medical School,

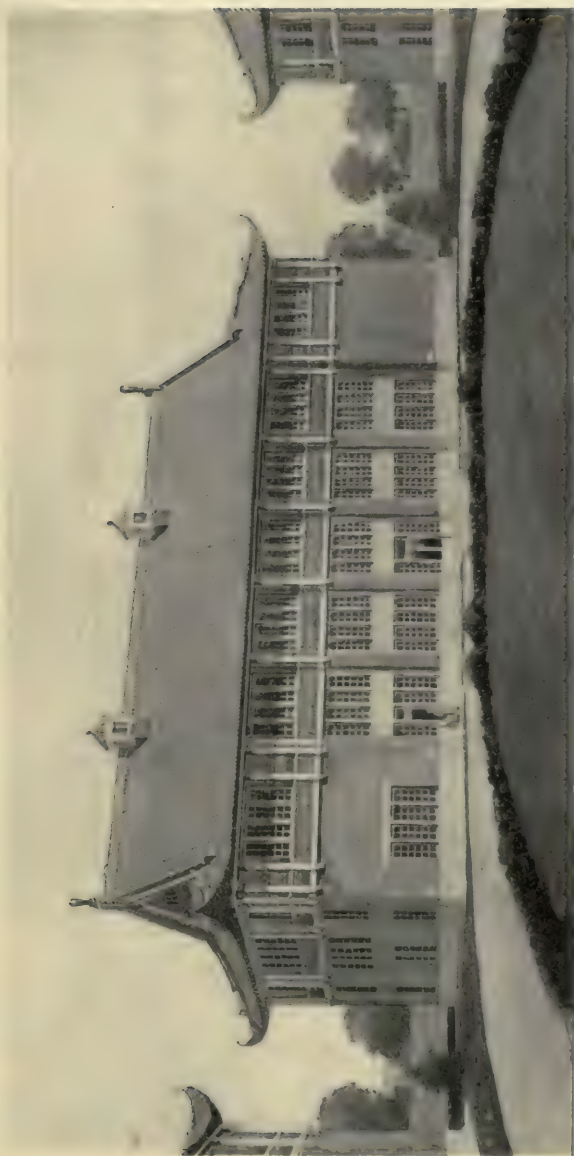


Fig. 79.—Architect's drawing of the new Science Building of St. John's University. The China Medical Board has contributed \$80,000 toward the construction of this building



Fig. 80.—Map of China, showing medical institutions aided by the China Medical Board (in addition to the Peking Union Medical College, supported in full.)

M.D. Formerly instructor in medicine and assistant physician, Union Medical College, Peking.

H. Jocelyn Smyly, M.A., M.D., F.R.C.S., I., Associate in medicine. Trinity College of Dublin University, undergraduate and medical work. Appointed to Union Medical College faculty under former management in 1913.

Charles W. Young, B.S., M.D., Associate in medicine. University of Illinois, B.S., 1897. Johns Hopkins Medical School, M.D., 1903. Connected with the Union Medical College under former management from 1906, for several years dean.

Frederick E. Dilley, M.D., Associate in surgery. Western Reserve University, M.D. Formerly acting head of department of surgery in the Union Medical College and superintendent of hospital.

Jui-heng Liu, B.S., M.D., Associate in surgery. Harvard University, B.S., 1910; M.D., 1913. Formerly connected with Red Cross General Hospital, Shanghai.

Way Sung New, M.D., Associate in surgery. Harvard Medical School, M.D., 1914. In charge of department of anatomy, Harvard Medical School of China, 1915-1916.

Tsing-meu Li, M.D., Associate in ophthalmology. Oahu College, Honolulu, T.H. St. John's University, Shanghai, School of Medicine. University of Pennsylvania, M.D., 1909. Formerly on staff of Hunan-Yale Hospital.

Paul C. Hodges, B.S., M.D., Associate in roentgenology. University of Wisconsin, B.S. Washington University School of Medicine, M.D., 1918. Formerly photomicroscopist to department of surgery, Washington University School of Medicine.

Robert Spencer Stone, B.A., Assistant in anatomy. Completed seven-year course in biology and physiology, University of Toronto, June, 1919, including first two years of medical course.

S. Y. Wong, M.S., Assistant in physiological chemistry. University of Chicago, B.S., 1916, M.S., 1917.

Geo. Y. Char, B.S., M.D., Assistant in surgery. Boone University, Wuchang. Harvard Medical School of China, M.D., 1914. Postgraduate study at Harvard Medical School, Boston City Hospital, New York Polyclinic Hospital, and hospital of the Rockefeller Institute. Resident urologist, Long Island College Hospital, and surgical house officer, Bellevue Hospital.

Arthur Waitah Woo, M.R.C.S., L.R.C.P., Assistant in obstetrics and gynecology. University College, London, M.R.C.S., L.R.C.P., 1913. Formerly obstetric and gynecological house surgeon, Middlesex Hospital, England.

Jui-hua Liu, M.D., Assistant in otology, rhinology, and laryngology. Anglo-Chinese College, Tientsin. Peiyang Medical College, Tientsin, M.D., 1915. Postgraduate work, 1917-1918, Harvard Medical School; 1918-1919 New York Eye and Ear Infirmary.

W. D. Swanson, Assistant in modern European languages.

C. M. Yü, Assistant in Chinese.

THE DEPARTMENT OF RELIGIOUS AND SOCIAL WORK

Philip Allen Swartz, B.A., Director of religious and social work. Lafayette College, B.A., 1910. Union Theological Seminary. Ordained by Presbytery of New-ark, 1917. Formerly pastor of church of Forest Hills, Long Island (union, undenominational).

Stephen Wang, B.A., Assistant to the director of religious and social work.

THE TRAINING SCHOOL FOR NURSES

Anna Dryden Wolf, M.A., R.N., Superintendent of nurses.

Mary Louise Beaty, B.S., R.N., Instructor.

Ruth Ingram, R.N., Assistant supervisor.

Departmental Supervisors

<i>Annie Brown, R.N.</i>	•	<i>Mary S. Purcell, R.N.</i>
<i>Florence Brown, R.N.</i>		<i>Hsiu-lan Pai</i>
<i>Kathleen Caulfield, R.N.</i>		<i>Martha Schaur, R.N.</i>
<i>Florence Kelley Goodman, R.N.</i>		<i>Bertha L. Sutton, R.N.</i>
<i>Frances S. Hall, R.N.</i>		<i>Lula Sweet, R.N.</i>
<i>Mary McCoy, R.N.</i>		<i>Faye Whiteside, R.N.</i>
<i>Callie Munger, R.N.</i>		<i>Cora J. Wong</i>
<i>Sophie Packer, R.N.</i>		

GRADUATE MALE NURSES ASSISTING IN WARDS

<i>Shao-jen Chuan</i>	<i>Hau-mien Tu</i>
<i>Yu-hwa Kao</i>	<i>Chun-ying Wang</i>
<i>Wen-shang Li</i>	<i>Hsu-hsien Wang</i>
<i>Yu-lin Lo</i>	<i>Hsueh-hai Wang</i>
	<i>In-chi Wang</i>

THE HOSPITAL AND PHYSICAL PLANT

Donald E. Baxter, M.D., Superintendent. Hiram College. University of Louisville, M.D. Wide engineering and administrative experience. Director of New York Committee on After Care of Infantile Paralysis Cases. Worked on organization of hospitals under Red Cross in France.

Donald W. Salisbury, B.Sc., Assistant superintendent. Middlebury College. Formerly engineer and chemist for the General Carbonic Company, New York.

Maynard V. Hull, B.A., Purchasing agent. Ohio State University. Research work, U. S. Public Health Service.

Edward Watson, Operating engineer.

George G. Wilson, Superintendent of buildings and grounds. On staff of college under former management; has been for several years on leave in war service.

H. C. Mao, bookkeeper.

A. J. D. Britland, M.P.S., Pharmacist.

Emily Gilfillan, B.A., Librarian, University of Michigan, B.A., 1914. Two and a half years assistant librarian of the Rockefeller Foundation.

E. Grace McCullough, Dietitian. Studied at Washington School of Cookery and Southern Homeopathic Medical College. Formerly dietitian, Massachusetts General Hospital, and Peter Bent Brigham Hospital, Boston. In 1913 investigated and reported on von Noorden Clinic, Vienna, Austria.

RESIDENT STAFF

Richard H. P. Sia, Assistant resident physician.

Ju-chi Chiang, Assistant resident surgeon.

Lee-chong Chu

Ju-kang Liu

Chung-hsin Han

Ta-chih Pa

Ying-teh Hu

Hua-teh Pi

Shih-en Kao

Ch'ing-sheng Shih

Hsien-wa K'ung

Yao-wen Sü

Sih-tse Wang

B. Shanghai Medical School

For several years past it had been the intention of the China Medical Board to erect at some time a second medical school which should be located in Shanghai. During the war, as a result of the difficulties in securing material, the export embargoes, the high prices and unfavorable exchange, as well as the uncertainty concerning all future enterprises, action in regard to the Shanghai school was necessarily postponed.

C. Other Medical Schools

Besides supporting the Peking Union Medical College, the China Medical Board has undertaken to aid in the educational work of a few medical schools which are administered by other organizations. Up to the present time these have all been missionary schools, but in the future it may be that appropriations will also be made to educational work under other auspices. During the past year no large sums have been appropriated with the exception of allowances designed to cover loss in exchange on earlier appropriations for the Hunan-Yale Medical School and the Shantung Christian University. Payments have been continued on appropriations already made for the salaries

of personnel and for maintenance in the medical courses of Yale in China and St. John's University, and in the medical school of the Shantung Christian University.

II. PRE-MEDICAL EDUCATION

A. Peking Pre-Medical School

With the undertaking of medical education in Peking, the problem of adequate preparation of students became serious. A good grounding in the English language and in the sciences of physics, chemistry, and biology is essential for modern medical work. As yet the schools and colleges in the vicinity of Peking are not prepared to provide this fundamental training. They have not the essential laboratories and equipment, nor the specialized teaching faculties. The Trustees therefore decided to open a pre-medical school in connection with the Peking Union Medical College. Eventually it is hoped that pre-medical training will be given by other agencies, and that the Board will be able to give up this branch of its work.

The pre-medical school opened in the autumn of 1917. Originally a two-year course was planned, but it has recently seemed necessary to prefix a third year to the course. The subjects taught are biology, chemistry, physics (including a certain amount of higher mathe-

matics), English, and Chinese. The last two years of the work are of strictly college grade. At the end of 1919 the pre-medical school had an enrollment of thirty-four students, twenty of whom were in the first year class. There were two women students enrolled. On graduation from the pre-medical department a certificate is issued which entitles the holder to enter the medical school without further examination. Four graduates of the pre-medical school have entered the medical school.

FACULTY. The present faculty of the pre-medical school is composed as follows:

William Warren Stifler, Ph.D., Assistant professor of physics, and dean. Shurtleff College, B.A., 1902. University of Illinois, M.A., 1908, Ph.D., 1911. Instructor in physics at Columbia University, 1911-1916.

Stanley D. Wilson, Ph.D., Assistant professor of chemistry. Wesleyan University, B.A., 1909, M.A., 1910. University of Chicago, Ph.D., 1916. Instructor in organic chemistry, Rice Institute, Houston, Texas, 1916-1917.

Charles W. Packard, Ph.D., Assistant professor of biology. Syracuse University, B.S., 1907, M.S., 1908. Columbia University, Ph.D., 1914. Instructor in biology at Columbia University, 1914-1918.

Adolf Eduard Zucker, Ph.D., Instructor in modern European languages. (See under faculty of medical school.)

K. M. Ma, Hsiu-ts'ai, Instructor in Chinese. (See under faculty of medical school.)

Bird R. Stephenson, M.S., Instructor in physics. Albion College, Michigan, B.A., 1914. University of Illinois, M.S., 1917. Assistant in physics, University of Illinois, 1917-1918.

Alice Middleton Boring, Ph.D., Assistant in biology. Bryn Mawr, B.A., 1904, M.A., 1905, Ph.D., 1910. University of Pennsylvania, fellow in zoology, 1905-1906. Wurzburg and Stazione Zoologica, Naples, 1908-1909. Associate professor of biology, University of Maine, 1913-1918.

C. T. Feng, Assistant in chemistry. Assistant in chemistry at the Union Medical College, 1915-1916. Postgraduate course in chemistry at Weihsien, 1916-1917.

W. D. Swanson, Assistant in modern European languages.

C. M. Yü, Assistant in Chinese.

B. Aid to Pre-Medical Education in Other Institutions

While it has seemed necessary to open a special pre-medical school in Peking, there are in the vicinity of Shanghai several colleges and universities with scientific departments which need only a certain amount of strengthening to enable them to prepare students for the Peking Union Medical College or for other institutions of good standing.

The following schools have thus far received aid from the China Medical Board for their pre-medical work:

St. John's University	Gold \$ 80,000
Fukien Christian University, total during five years	Gold 163,500
Ginling College, total during five years .	Mex. 12,000
Ginling College, equipment	Gold 5,000

In 1918 St. John's University in Shanghai had received a tentative promise of \$80,000 as soon as plans for increasing its scientific department had been perfected. Twelve hundred dollars was used in 1918 for a fellowship for a Chinese teacher of science for study in the United States. The remainder (\$78,800) has now been granted to be used toward the building and equipment of a science laboratory.

Appropriations for Fukien Christian University, conditioned on the raising of certain additional funds, were made in 1917. The Trustees of this school have found some difficulty in securing the required amount, but the money is now in hand and building plans have been prepared. The pre-medical school was opened in February, 1919, with nine students.

Ginling College, an institution for women, was recently opened in Nanking. It has a small, but able and enthusiastic, scientific staff.

As the Peking Union Medical College expects to admit women students on the same basis as men, a grant to this institution was appropriately made.

C. Aid to Mission Hospitals

From the beginning of its work, the China Medical Board has been interested in the development of mission hospitals, and has offered to share in increasing the staffs, enlarging the buildings, and supplying new equipment for a few selected, well managed hospitals.

While the strengthening of hospitals is of the greatest importance for the sake of their service to the sick, it has a bearing also on the work of the medical schools. After graduation, service as an interne in a good hospital is required. Some of the students of the Peking Union Medical College will be taken into the hospital in Peking. Many others will go into mission hospitals, and a well equipped, adequately staffed hospital is necessary to provide for this further training.

Since the establishment of the China Medical Board, grants have been made to thirty-three hospitals. The present program looks toward the limiting of appropriations to a few strong hospitals. Selection will be made on the basis of the size and adequacy of the buildings and

equipment, the efficiency of management, the number of the staff, and the accessibility and importance of the center in which the institution is located. Hereafter, appropriations will be made only when the controlling society is prepared to put into the proposed enlargement an amount equal or more than equal to the contribution of the China Medical Board.

A total of \$77,378.49 was paid out during the year on account of appropriations to nineteen missionary hospitals, plus a further sum of \$50,244.36 on account of loss by exchange. The unfavorable exchange rate has made it necessary for missionary societies to guarantee a fixed rate, on payments in the field, of two dollars in Mexican currency for one dollar in gold. The earlier appropriations of the China Medical Board were made at a time when the exchange rate was normal, and it was the natural expectation of the missionary societies that the Board's grants would bring a doubled amount in Mexican silver.

While the Board was not legally obligated to make good the loss by exchange, it felt that it was only fair and proper to meet the missionary societies in their endeavor to keep payments in China on a normal basis, regardless of the amount it would cost in the United States. At the present time, new grants are made in

Mexican currency, so that variations in exchange will not affect the sums made available in China.

During the year new appropriations were made to hospitals in Anking, Kiukiang, Soochow, Tehchow, and Wuhu. Details will be found in the Treasurer's report, pages 345 to 406.

D. Fellowships and Scholarships

Pending the opening of the Peking Union Medical College, a number of fellowships for study in the United States have been granted, to both Chinese and missionary physicians and nurses. It is hoped that when the Peking school is fully established, the Chinese fellowships, at least, may be reduced in number, and that only specially qualified men will be sent to the United States for graduate work in advanced subjects which the Peking college may not be so well prepared to offer as some of the schools in the United States.

Summer courses and graduate courses will be provided in Peking for medical missionaries and for other physicians. The year on furlough in the United States, that is granted to all missionaries also affords a good opportunity for study; and as it may not always be convenient, even during the summer vacation, for practi-

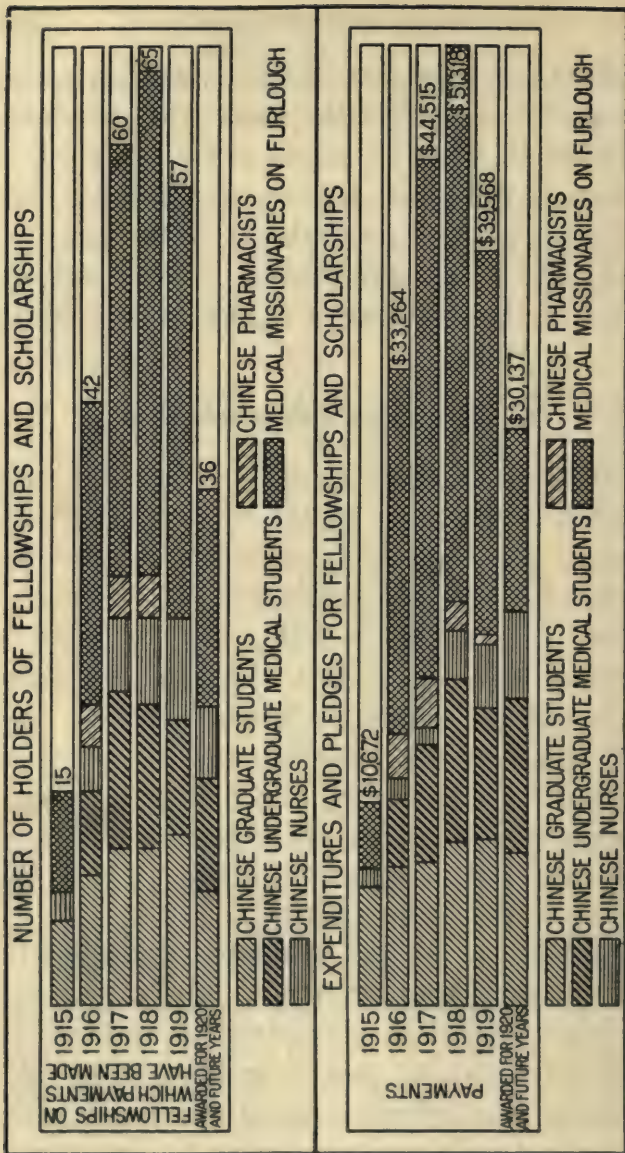


Fig. 81.—Number of fellowship and scholarship holders, by years, since the creation of the China Medical Board

tioners while in China to take time from their pressing duties and devote it to study, it is probable that small grants to cover tuition fees, books, and so forth, will be continued for physicians and nurses on furlough in the United States.

During the past year, thirty medical missionaries and nurses on furlough, twelve Chinese graduate students, eight Chinese undergraduate medical students, and seven Chinese nurses studied in the United States with the aid of fellowships which aggregated \$39,568. Fig. 81 shows by years the number of fellowships and scholarships that have been granted, the total payments made on them, and the pledges for future years.

The following is a list of persons who have studied in the United States during the past year under the auspices of the Board:

MISSIONARIES

N. Worth Brown, M.D., Formerly Nanking University.
Studied at Johns Hopkins University.

James R. Cox, M.D., West China Union University, Chengtu. Studied at New York Postgraduate Medical School and New York Eye and Ear Infirmary.

F. P. Gaunt, M.D., Wuhu General Hospital. Studied at Mayo Clinic, Rochester, Minn.

- G. L. Hagman, M.D.*, Foreign Christian Hospital, Nantungchow. Studied at Harvard Medical School.
- J. Charles Humphreys, M.D.*, American Baptist Hospital, Ningyuenfu. (On return to China went to Yachow.) Studied at University of Pennsylvania and Hahnemann Hospital, Philadelphia.
- E. M. Johnston, M.D.*, Formerly Union Medical College, Peking. Studied at Mayo Clinic, Rochester, Minn.
- C. B. Kelly, M.D.*, West China Union University, Chengtu. Studied at New York Postgraduate Medical School.
- A. R. Kilgore, M.D.*, Formerly Red Cross General Hospital, Shanghai. Studied at Johns Hopkins University.
- George W. Leavell, M.D.*, Southern Baptist Hospital, Wuchow. Studied at Johns Hopkins University.
- C. S. F. Lincoln, M.D.*, St. John's University, Shanghai. Studied at Johns Hopkins University.
- O. T. Logan, M.D.*, American Presbyterian Hospital, Changteh. Studied at Johns Hopkins University.
- O. Houghton Love, M.D.*, American Board Hospital, Tungchow. Studied at Johns Hopkins University.
- P. L. McAll, M.D.*, Shantung Christian University. Studied at Toronto University and New York Postgraduate Medical School.
- J. Preston Maxwell, M.D.*,¹ Formerly English Presbyterian Hospital, Yungchun. Studied at Johns Hopkins University.
- W. S. T. Neville, M.D.*, Formerly Union Medical College, Peking. (Now at Moukden Medical College.) Studied at Johns Hopkins University and Mayo Clinic, Rochester, Minn.

¹ Appointed to Peking Union Medical College.

Alice M. Powell, Nurse, Women's Methodist Hospital, Peking. Studied at Teachers College, Columbia University.

Emma E. Robbins, M.D., Methodist Episcopal Hospital, Chinkiang. Studied at Columbia University.

Florence Sayles, Nurse, Women's Methodist Hospital, Tientsin. Studied at Teachers College, Columbia University.

Charles W. Service, M.D., West China Union University, Chengtu. Studied in Toronto and at Johns Hopkins University.

T. Dwight Sloan, M.D., University Hospital, Nanking. Studied at Johns Hopkins University and in Boston.

Lula Sweet,¹ Nurse, Formerly Red Cross General Hospital, Shanghai. Studied at Johns Hopkins Hospital.

Sada Tomlinson, Nurse, St. James' Hospital, Anking. Studied at Teachers College, Columbia University.

C. E. Tompkins, M.D., American Baptist Hospital, Suifu. Studied at University of Michigan and Bellevue Hospital, New York.

George T. Tootell, M.D., Northern Presbyterian Hospital, Changteh. Studied at University of Pennsylvania.

F. F. Tucker, M.D., American Board Hospital, Tehchow. Studied at Rush Medical School and at Harvard Medical School.

Anna Vogt, M.D., Norwegian Mission Hospital, Yiyang. Studied at New York Post Graduate Medical School.

Volrath Vogt, M.D., Norwegian Mission Hospital, Yiyang. Studied at New York Post Graduate Medical School.

¹ Appointed to Peking Union Medical College.

Fred J. Wampler, M.D., Church of the Brethren Hospital, Pingtingchow. Studied at Harvard Medical School.

Andrew H. Woods, M.D.,¹ Formerly Canton Christian College. Studied at hospitals in Philadelphia.

J. M. Wright, M.D., Canton Union Hospital. Studied at Harvard Medical School.

CHINESE GRADUATE STUDENTS

George Y. Char, M.D., Formerly American Church Mission Hospital, Wuchang. Studied at Bellevue Hospital, New York.

H. P. Chu, M.D., Formerly Red Cross General Hospital, Shanghai. Studied at Harvard Medical School.

Edward Young Kau, M.D., Hunan-Yale Medical School. Studied at hospitals in New York and Boston.

Chong-eang Lim, M.D., Peking Central Hospital. Studied at School of Hygiene and Public Health, Johns Hopkins.

C. C. Liu, M.D., Peking Union Medical College. Studied at Washington University.

Jui-hua Liu, M.D.,¹ Formerly Red Cross General Hospital, Shanghai. Studied at Harvard Medical School and New York Eye and Ear Infirmary.

Mary Tai, M.D., Women's and Children's Hospital, Nanchang. Studied at various hospitals in New York.

Yao Wong, M.D., Hunan-Yale Medical School. Studied at Harvard Medical School.

Arthur Waitah Woo, M.D.,¹ Formerly Middlesex Hospital, London. Studied at Johns Hopkins University.

¹ Appointed to Peking Union Medical College.

L. S. Woo, M.D., St. Luke's Hospital, Shanghai. Studied at Harvard Medical School and Children's Hospital, Boston.

Hsien Wu, Physiological chemist, under consideration for appointment to Peking Union Medical School. Studied at Harvard Medical School.

Zung-dau Zau, M.D., Formerly Red Cross General Hospital, Shanghai. Studied at Harvard Medical School and hospitals in Boston.

CHINESE UNDERGRADUATE STUDENTS²

Sheo-nan Cheer, Johns Hopkins University.

Chen-hsiang Hu, Harvard Medical School.

Tze King, Harvard Medical School.

Wen-ping Ling, Harvard Medical School.

Ven-tsao Loh, Harvard Medical School.

Cheuk-shang Mei, College of Physicians and Surgeons.

Ernest Tso,³ Harvard Medical School.

Shu-tai Woo,³ Harvard Medical School.

CHINESE NURSES

Mabel Mooney, Red Cross General Hospital, Shanghai, Massachusetts General Hospital, Boston.

Winifred Mooney, Red Cross General Hospital, Shanghai, Massachusetts General Hospital, Boston.

Elizabeth Sze, Mary Black Hospital, Soochow, Johns Hopkins Hospital.

² With the exception of Cheuk-shang Mei, all of these men were students at the Harvard Medical School of China, which closed in 1916, when the China Medical Board assumed responsibility for the completion of their medical education.

³ Graduated in February, 1919, and commenced internship immediately: Ernest Tso at Boston City Hospital, and Shu-tai Woo at Massachusetts General Hospital.

Zing-ling Tai, Red Cross General Hospital, Shanghai.
Peter Bent Brigham Hospital, Boston.

Loo-sung Woo, Woman's Union Missionary Society,
Johns Hopkins Hospital, Baltimore.

Lillian Wu, Danforth Memorial Hospital, Johns Hopkins Hospital, Baltimore, and Memorial Hospital, Worcester, Mass.

Wei-li Yih, Red Cross General Hospital, Shanghai, Simmons College, Boston.

E. Miscellaneous

China has not as yet a standardized medical terminology. Committees of the China Medical Missionary Association and of the National Medical Association have been working for some years on this problem. The Publication Committee of the China Medical Missionary Association has translated, and published in Chinese, standard textbooks for use in medical schools. As it is probable that medicine will eventually be taught wholly in the Chinese language, these beginnings are important. The China Medical Board has made a contribution to the Publication Committee of Mex. \$10,000 a year for two years.

F. The Board

The Board has held three stated meetings during the year, and in addition there have been numerous meetings of the Executive and

Building Committees. The Resident Director in China, Mr. Greene, spent the spring of 1919 in America, attending the April meeting of the Trustees of the Peking Union Medical College and the May meeting of the China Medical Board.

Early in June the General Director, the Resident Director, and the Director of the Peking Union Medical College (Dr. McLean) sailed for China. Mr. Vincent and Mr. Greene spent several weeks in Peking and Shanghai, and visited medical institutions in Seoul, Moukden, Tsinanfu, Changsha, Hankow, Canton and other cities, while Dr. McLean remained practically all summer in Peking. The General Director returned to this country in October and Dr. McLean in November.

305

CHINA MEDICAL BOARD

A Review of Its Work from 1915 to 1919

By Roger S. Greene
Resident Director in China

It is now four years since the work of the Board was begun in China. The Resident Director arrived in Peking in August, 1915, and with the exception of a six months' absence in the beginning of 1919 he has been on the field ever since that time. During the past two years Dr. H. S. Houghton has also given considerable time to the general work of the Board, in addition to the special tasks which he has undertaken in connection with the medical schools at Peking and Shanghai. An office has been maintained at Peking since 1915, with the necessary accounting and clerical staff.

The work of the Board in China will be treated under three main heads: (1) medical education; (2) aid to hospitals; (3) fellowships and scholarships.

Medical Education

PEKING UNION MEDICAL COLLEGE

In medical education the main effort during the period under review has been devoted to the reorganization of the Peking Union Medical College and the construction of its new plant.

The China Medical Board took over the property of the Union Medical College in 1915, by arrangement with the London Missionary Society, and assumed the financial support on July 1 of that year. The new board of trustees was organized on January 24, 1916, and immediately took over control of the institution. A charter was granted on February 24, 1916, by the Regents of the University of the State of New York. In the autumn of the same year the three lower classes of students then in the school were transferred to the Shantung Christian University Medical School, at Tsinan, in order to facilitate the work of reorganization. Two classes were left to complete their clinical studies at Peking, the last of which, containing thirteen students, graduated in June, 1918. Dr. Franklin C. McLean was appointed in 1916 as professor of medicine and head of the new institution. He made a preliminary trip to China in the summer of that year to look into the situation at Peking and to visit other medical schools and hospitals in China. He has made two other

short visits to Peking, but during the war was unable to keep up his work, as he was commissioned in the Medical Reserve Corps of the army and was later sent to France as senior consultant in general medicine for the American Expeditionary Force.

Pre-medical School. In 1917 the first appointments were made to the faculty of the pre-medical school, and the instructors in physics and chemistry arrived in Peking in time to open that department in the autumn with seven students. It was hoped at first that by requiring one year of college work for admission, in addition to middle school graduation, it would be possible to limit the pre-medical classes to two years, but the quality of the instruction in existing colleges left so much to be desired, and there seemed such grave danger of excluding promising students if the requirement were maintained, that it was decided to offer the preliminary year in our own school and to admit students directly from middle schools. This has been done with very satisfactory results. The staff of the pre-medical school, consisting of teachers with some years of experience in the best American colleges, is now practically complete; very convenient buildings have been provided through the improvements in Lockhart Hall and the Oliver Jones Dormitory, in which the old school had been housed; and the laboratories are in good working order. The first class was graduated in June, 1919, and entered the medical school the following autumn. The teachers in the medical school who have worked with these young men during the past few months are very much pleased with the ability which they show, both in the use of the English language and in their laboratory work, in which they compare favorably with undergraduates in good medical schools at home. There are probably few medical schools in the United States which have the advantage, for their entering classes, of such a uniform and thorough preparation in the sciences. The total registration in the pre-medical school is now as follows: first year, twenty-one; second year, eight; third year, five; total, thirty-four.

The large registration in the entering class this autumn gives ground to believe that within a very short time the number of qualified students applying for admission will be as large as the school can conveniently receive. Two young women were admitted to the pre-medical school this autumn, in accordance with a decision of the trustees, in the spring of 1919, that women should be admitted on the same basis as men. Both are good students, and this innovation has thus far caused no difficulties of any kind. For the present, the women students are housed in the same compound with some of the women members of the teaching and administrative staff.

Medical School. The organization of the medical school is naturally less advanced. The following heads of departments or sub-departments are already at work in Peking: Dr. E. V. Cowdry, professor of anatomy; Dr. Davidson Black, professor of embryology

and neurology; Dr. H. J. Howard, professor of ophthalmology; Mr. B. E. Read, associate professor of physiological chemistry; and Dr. A. M. Dunlap, associate professor of otology, rhinology, and laryngology. The professors of medicine, surgery, pathology, and gynecology and obstetrics, and the associate professor of neurology and psychiatry, have all been appointed and will come to China in the spring or summer of 1920. Numerous appointments have been made also to junior positions in these departments, and it is expected that the staff will be nearly complete by the autumn of 1920. There are now seven students in the first year of the medical school and three graduate students, one of whom is taking the regular first-year course.

Nurses' Training School. The nurses' training school will be opened in the autumn of 1920 upon an entirely new basis. Miss Anna Dryden Wolf, the superintendent of the school, arrived in China in the summer of 1919, and eight other new American nurses have also come. They are spending most of their time at present in language study and in other preparation for the reorganization of the school. Several other nurses have also been recommended for appointment. While only women students will be admitted to the training school in the future, the services of the male nurses now employed in the old hospital will be utilized until a sufficient number of women nurses can be secured. The new course, which will cover four years, will require middle school graduation and a working knowledge of English for admission. A year of classroom and laboratory training will be provided before the pupils are admitted to the wards. Since in the past, in China, even less attention has been given to nurses' training than to medical education, this school is a most important contribution to medical progress in this country.

Construction of New Buildings. The construction of the new buildings of the medical school has now been in progress for two years. The anatomy building is practically finished and is already occupied by teachers and students. The chemistry and physiology buildings are to be finished by the end of January, 1920. The pathology laboratory and the other buildings of the hospital group will be completed one by one during 1920, and it is hoped that it will be possible to move into the hospital towards the end of the year. The buildings have been largely visited during the past year by the general public and have aroused much interest, on account of the convenience of their arrangements and on account of the Chinese architectural features of the exteriors. They represent a more substantial type of modern construction than has been attempted before in North China.

Maintenance of Old Hospital. During this transition period between the old and the new organization of the school, the men's

hospital, formerly conducted by the London Mission on Hsin K'ai Lu, has been kept open and provided with additional equipment and staff, but it was considered advisable to close the women's hospital, since it was quite inferior to the men's department in buildings and equipment and would have required a considerable expenditure to make it satisfactory. As the Methodist Mission has a large women's hospital nearby, it did not seem wise to incur such expense for a small and purely temporary women's department at a distance from the main institution. The Methodist Women's Hospital courteously furnished clinical instruction in obstetrics and gynecology for the students remaining in Peking, in return for which the pathologist of the Peking Union Medical College taught the classes in his subject in the North China Union Medical College for Women. The maintenance of the men's hospital, besides keeping together the clientele of the institution, has made it possible to develop an organization which can be later moved over to the new buildings. In particular, it has been possible to secure and retain a few good Chinese doctors and nurses trained in American schools, for whom there were no other equally satisfactory opportunities in China. During this year the general surgical service has been entirely in the hands of Chinese doctors, and they have won the confidence both of their associates and of the many foreign residents who have come to the hospital for important operations. A Chinese nurse, who received her training in Philadelphia and New York, has been in charge of the operating room. The hospital has also performed an important service in caring for the health of the staff and students of the departments already opened, as well as that of the numerous Chinese and foreigners employed in the construction of the new buildings.

SHANGHAI MEDICAL SCHOOL

In accordance with the intention of the Rockefeller Foundation to establish a second medical school at Shanghai, the board of trustees of the Shanghai Medical School of the Rockefeller Foundation was organized on May 18, 1917, under a charter granted on April 12, 1917, by the Regents of the University of the State of New York, and Dr. Henry S. Houghton was appointed acting dean.

A very advantageous site in the French Concession, easily accessible from the Chinese city on one side and from the best residential districts in the foreign settlement on the other, with a total area of twenty acres, has been already purchased. Like most other land in Shanghai, it requires filling, and a beginning, therefore, has been made at grading it up to the level of the streets around the property. Some preliminary studies of the plans for the buildings have also been made.

During the war, final consideration of the matter of opening a School in Shanghai was postponed.

ST. JOHN'S UNIVERSITY MEDICAL SCHOOL

St. John's University, which had planned to keep its medical school open until the new institution should be ready to receive those of its students who wish to take a medical course, finds itself somewhat embarrassed by the present uncertainty as to the date of opening of the Shanghai Medical School. During this transition period the China Medical Board has for four years made a contribution towards the support of one of the teachers in the medical department of St. John's University. There has been little other development of the organization or equipment of this institution.

HARVARD MEDICAL SCHOOL OF CHINA

The Harvard Medical School of China closed its doors in June, 1916, its trustees having decided that the sum necessary to maintain a really efficient medical school, especially under war conditions, was much greater than any amount which they could reasonably expect to raise from the alumni and undergraduates of a single university.

During the four years of its existence the school graduated two classes, numbering in all nine students, who had had the earlier part of their course in other institutions. Provision was made by the China Medical Board for continuing the education of some of the more promising undergraduate students, seven of the best being sent to the United States, where two have since graduated at the Harvard Medical School, in Boston, with very creditable records. Four others should graduate during the next two years at Harvard, and one at Johns Hopkins. The teachers of these young men have spoken in high terms of the work they have done since going to the United States. Their abilities appear to be distinctly above the average of students in American medical schools, so far at least as can be judged by their school records. Some of these men will be very useful for the junior house positions in the new hospitals now being erected in China.

An endowment fund of \$25,000, formerly held by the Harvard Medical School of China and known as the Henry Sturgis Grew Memorial Fund, has been transferred to the Rockefeller Foundation for the use of the Shanghai Medical School. Some of the equipment and other property of the school was sold, and some was given to the China Medical Board.

RED CROSS GENERAL HOSPITAL

From July 1, 1916, to June 30, 1918, the Red Cross General Hospital, at Shanghai, which had been used by the Harvard Medical School of China for its clinical teaching, was maintained by the China Medical Board, thus completing the five-year period for which the Harvard Medical School of China had arranged with the Chinese Red Cross Society to carry on the institution. During these two

years the hospital rendered a much-appreciated service to the foreign community at Shanghai and was able to carry on the training as internes of promising Chinese doctors who had graduated from the Harvard Medical School of China. An experiment was also undertaken in the training of Chinese women nurses to care for men as well as women patients, and while only a few pupils could be received, the degree of success attained justifies the belief that the same system, which is to be adopted on a larger scale and under more favorable conditions in the new training schools at Peking and Shanghai, will prove entirely practical.

The sum of \$76,209 was appropriated for the maintenance of the hospital during the two years, but the actual cost to the Board after the liquidation of all the accounts will be only about \$60,000 gold. The total expenditures of the hospital during this period amounted to \$151,469 Mex. The hospital is now being maintained by the Seventh Day Adventist Mission.

SHANTUNG CHRISTIAN UNIVERSITY MEDICAL SCHOOL

In the spring of 1916, when it was decided to transfer to the Shantung Christian University Medical School the three lower classes from Peking, it was found that, in order to enable that institution to receive the additional students and give them adequate instruction, it would be necessary to enlarge the buildings and provide additional staff and equipment. Grants were accordingly made of \$50,000 gold for buildings and equipment and \$100,000 spread over five years for maintenance. Additional sums, amounting to \$70,000 gold, were appropriated later to cover loss by exchange on these items due to the extraordinary rise in the price of silver. The results obtained with these appropriations have been highly gratifying.

Improvements in Buildings. The old building of the school was remodeled, the interior arrangement being entirely changed and much better utilization of space and light secured. Two wings were built, one to the east, accommodating the departments of physiological chemistry and pharmacy in the first floor and basement, with a large assembly room on the second floor; and another to the west, containing the laboratories for anatomy, histology, and pathology. With the development of departmental organizations, each with one instructor in responsible charge, the conception of the needs of these departments is being enlarged, and more space is now urgently desired for laboratories; but considering the money that was available, a very convenient and attractive building was secured. Two small dormitories, each accommodating thirty-two students, two in a room, were also constructed with the funds from the China Medical Board. Some improvements were also made in the hospital, out-patient department, and old dormitories. The buildings and

equipment are well cared for, and the general aspect of the institution is such as to impress the visitor most favorably.

Faculty. There have been supported from the funds granted by the China Medical Board for maintenance: Dr. Thornton Stearns, a junior member of the department of surgery; Dr. P. S. Evans, Jr., who is teaching physiology; Mr. B. M. McOwan and Mr. F. E. P. Kwoh, instructors in English; the Misses Dinkelacker, nurses; and Mr. T. Y. Ch'eng, pharmacist, who had two years in the United States under a scholarship from the China Medical Board. Mr. Frank H. B. Harmon has been lately engaged as business manager. Dr. E. R. Wheeler, of the Medical Missionary Society of London, was also supported for a time from this fund, but the responsibility for his salary has been assumed by the Baptist Missionary Society of England.

Concentration at Tsinan of Medical Education in Chinese.

As a result of the recommendation of the Executive Committee and the Council on Medical Education of the China Medical Missionary Association, that medical education in the Chinese language under missionary auspices be concentrated at Tsinan, there has been a notable development in this direction in the last three years. The union medical schools at Nanking and Hankow have been definitely closed, and some of their faculty and students have gone to strengthen the school at Tsinan. If it be considered also that the existence of Peking Union Medical College, as an institution teaching in Chinese and dependent on the missionary societies for support, has come to an end, it will be seen that the Tsinan school takes the place of four which existed in 1914. While the difficult financial situation and shortage of personnel due to the war, with some other complications, have prevented the concentration at Tsinan of all the resources formerly scattered between the four schools, nevertheless Tsinan has received something from each of these institutions, and as soon as normal conditions return it will be able to make an appeal for funds in Great Britain and the United States with an effectiveness that no one of the old schools could have equalled. A fifth school, that maintained by Dr. D. Duncan Main at Hangchow, has been obliged, for lack of staff, to suspend temporarily the admission of new students. There is no class under instruction at present, and it is not yet known when one can be received. Partly through the introduction of the Peking office, the new union of Norwegian American Lutheran Missions, which had not previously shared in the maintenance of any medical school in China, joined in the school at Tsinan and contributed the services of a pathologist, Dr. L. H. Braafladt. The English Wesleyan Missionary Society is the latest organization to join the union. It has promised the full support of one or more members of the staff, but an annual contribution is also being made by the English Presbyterian Mission. The Church of England and Canadian Presbyterian Missions have committed

themselves to a larger measure of support for the Tsinan school than they ever gave to any of the old institutions. With the English Baptist Mission, the Northern and Southern Presbyterian Missions, and the London Mission, there are now nine societies contributing to the school, as against two at the time when the first appropriation was made by the China Medical Board.

Department Organization. The department organization is proceeding slowly. Dr. R. T. Shields has been placed in charge of the department of anatomy, but will devote himself mainly to histology and embryology. Dr. C. K. Roys, who had been teaching the gross anatomy, recently returned from a year of study and teaching at the University of Minnesota, but has been obliged to leave again on account of ill health. A fair supply of anatomical material is now assured, as the military and the police are both turning over unclaimed bodies, and it has been found possible also to use unclaimed dead from the school hospital. Dr. J. B. Neal was giving the physiological chemistry until recently, but this year he has been relieved by Dr. Peter Kiang, a graduate of the University of Pennsylvania Medical School, who held a fellowship from the China Medical Board for one year. Dr. P. S. Evans, Jr., after a year of special work at Johns Hopkins University, has taken charge of the department of physiology, but has been temporarily obliged to assist also in teaching, at first pathology and more lately clinical microscopy. A roentgenologist, Dr. Stanley Ellis, has been sent out from Great Britain, and has been provided by a special gift from a British friend of the institution with part of the equipment for his department. The most urgent need at present is for a well-qualified teacher of internal medicine, but men for obstetrics and gynecology, and for eye, ear, nose, and throat, should also be secured at once. It is expected that some of the additional three or four men promised by the British missions will be available for these positions. There are now four foreign nurses in the school hospital, a more nearly adequate number than there has ever been before.

Proposed Enlargement. The faculty is now considering plans for enlargement of both hospital and laboratories, and there is reason to hope that it will be able to secure from its own constituency, in China and abroad, the necessary funds for this purpose. Advisory boards have been formed in Great Britain and the United States, as well as a local Chinese committee in Tsinan, which will be of great help in raising money.

Students. The first of the three classes sent down from Peking, numbering twenty-one students, graduated in June, 1919. On the whole, the students have adapted themselves very well to the new conditions, and in most of the pre-clinical subjects they have been getting better instruction than preceding classes at Peking ever received. The total number of students last year was 132, of whom forty were in the senior class. The remaining ninety-two were

divided among four classes of a more manageable size, and having had a better scientific foundation for their clinical work, they should, when they graduate, prove more useful than their predecessors have done.

Translation and Terminology. In addition to their teaching, some of the members of the faculty have been actively engaged in the translation of medical textbooks and in co-operating with the Chinese national committee on medical terminology. It is hoped that the terms for chemistry, anatomy, histology, and bacteriology will be completed by the summer of 1920.

HUNAN-YALE MEDICAL COLLEGE

In 1915 the China Medical Board began contributing to the support of the Hunan-Yale Medical College, at Changsha, at the rate of \$16,200 per annum for a five-year period, which expires this year, making a total of \$81,000. Later this grant was increased by \$15,200, payments being made on a diminishing scale during three years. These sums have been used mainly for the employment of additional teachers in the pre-medical and medical schools. Grants amounting to \$37,764.75 were also made for the erection and equipment of a laboratory building for the pre-medical sciences. The Hunan provincial government has been also contributing to this school, having pledged \$25,000 Mex. per annum through 1916 and \$50,000 Mex. per annum after that date. Payments were regularly made up to and including 1917, but since that time, on account of the civil war in Hunan Province, they have been seriously delayed, and now there is a considerable balance outstanding on the amount due for 1919. Gentry of the province have advanced \$15,000 to help tide the school over until the government pays the full amount due. There was also a loss of about \$14,000 on the 1918 account, owing to the payment of part of the grant in depreciated notes. The Hunan government has also contributed \$30,000 Mex. for land and has promised \$156,000 Mex. for buildings, of which \$28,048 has been paid. Of this amount \$17,000 is being spent on a building, containing both dormitory and classrooms, which is now approaching completion.

Organization. During the greater part of this period the Yale Mission has been itself supplying two physicians with foreign training, two pre-medical teachers, and two foreign nurses at a nominal cost of between \$6,000 and \$10,000 gold per annum. The actual cost increased to \$15,293.91 gold in the year 1918-1919, owing to the high price of silver. No considerable increase has been made by the Yale Mission in its contribution to the medical school proper during the past four years, apart from covering the loss by exchange, although it has strengthened the staff of the pre-medical departments, which really belong to the arts college. Ill health of the teachers or their families, resignations, and the demands of war

work at home have prevented even a modest development of the staff, which is quite inadequate for the work. The most serious defect is that there are no specially qualified teachers for the pre-clinical sciences: anatomy, physiology, and physiological chemistry have had to be taught mainly by clinical men. Pathology has been taught by Chinese who have had some training abroad but who cannot be regarded as fully qualified. There is no physiological chemist. The following members of the staff are at present on the field: Dr. Yen Fu-chun, preventive medicine and surgery; Dr. J. R. Bromwell Branch, surgery, gynecology, and obstetrics; Dr. A. S. Crawford, anatomy and general surgery (on sick leave); Dr. G. Hadden, physiology and medicine; Dr. Chu Hung-pih, histology, pathology, and physiological chemistry; Dr. G. G. Davitt, bacteriology, pharmacology, and ophthalmology; Dr. T. C. Liea, anatomy; Dr. T. L. Li, dermatology and urology; Dr. Helen Cage, pediatrics, Dr. S. Shibley and Dr. J. H. Foster (language study), medicine; and Mr. G. K. How, pharmacy and materia medica. Dr. E. H. Hume, who has charge of the department of internal medicine, is in the United States. There are four nurses with full American training, one of whom is a Chinese, and another Chinese nurse who had a year of graduate work in America. Another American nurse has come out, but is still in the language school at Peking. Lately the Wesleyan Mission has contributed a man to the staff. The American Presbyterian and Episcopal Missions, which are also working in Human Province, have been asked to co-operate, but they have not yet made any definite promises of support.

Students. There are now four classes in the medical school, the whole course being five years. The first class, having entered in 1916, will graduate in June, 1921. The school has been fortunate in having had from the beginning sufficient anatomical material to give its students a full course in dissection. In general, the equipment for the laboratory courses has been very inadequate, and the old Chinese mansion in which the school has been housed is ill-adapted to use for laboratories, but in visiting the school one receives the impression that all the facilities available are being used to their utmost capacity and that a real scientific enthusiasm is being instilled into the students. The use of English as a medium of instruction helps to increase the proportion of mentally alert and enterprising students, and in this respect Changsha undoubtedly has the advantage of Tsinan, with its nominally equivalent admission requirements and superiority in buildings and equipment. There are now eleven students in the fourth year, nine in the third, eleven in the second, and eight in the first year, or thirty-nine in all in the medical school proper.

Hospital. The new hospital, which cost \$175,000 gold, was opened on February 15, 1918. A good deal of the interior finish,

such as painting of the walls, still remains to be done, and the equipment is incomplete, the funds for this purpose having been exhausted, but the building makes on the whole a very favorable impression. Its gross operating expenses for the year ending December 31, 1918, excluding salaries charged to the school account, were \$36,438, or, deducting hospital earnings, \$19,962 Mex. net—a very modest figure, showing the severe economy which must be practiced.

Pre-medical School. There is at present only one qualified instructor in each department of the pre-medical school except the department of biology, in which there are two instructors. There are nine students in the third year, twenty in the second, and twenty-one in the first or preparatory year, which has been added to make good the deficiencies in the middle schools. Several of the local schools are sharing in the expense of maintaining this class. With the completion, in the summer of 1920, of the laboratory building, which is now being erected with funds given by the China Medical Board, the pre-medical sciences will be fairly well housed for the time being.

Future Prospects. The Hunan-Yale Medical College is now at a very critical period in its existence. Those concerned realize that the successful maintenance of the institution will require much larger funds than there is any prospect of getting in the near future. The strain on the leaders in this enterprise has been much too heavy, and it is a serious question how much longer they should attempt to bear the responsibility, unless they can secure a broader basis of support which will enable them to get the additional teaching and administrative staff necessary to carry on the school. Unless there is a complete change in the political situation, there is little prospect of any additional support from the provincial government, and even the collection of the amounts due on the original pledge is likely to be a matter of constant difficulty. Various plans for obtaining a more secure financial basis for the school have been discussed, but little definite progress has been made up to the present time.

OTHER MEDICAL SCHOOLS UNDER MISSION AUSPICES

Other medical schools under mission auspices, or associated with missionary organizations, are the Union Medical College, at Foochow; the medical department of the West China Union University; the Moukden Medical College, conducted by Dr. Dugald Christie; the North China Union Medical College for Women, at Peking; and the Kwangtung Kung Yee Medical College and the Hackett Medical College for Women, at Canton. There is little new to report regarding these institutions. The future of the Foochow school is uncertain, as those interested in it have apparently not been unanimously agreed as to the desirability of continuing to maintain it as a part of the new Fukien Christian University.

Canton. The Kung Yee Medical College, at Canton, has recently arranged with the Canton Hospital for co-operation in medical education. The proposal is viewed with anxiety by some friends of the hospital on account of the low standards hitherto maintained at the Kung Yee school. It is a serious question whether better results could not be obtained if the missions would use their resources to strengthen the Hongkong University School of Medicine and would send their students there instead of trying to maintain a school in Canton. This solution does not meet with much favor in Canton, the main objections being the high cost of the Hongkong course and the reluctance of many Chinese on the mainland to go to a British colony for their education. It may be that both these difficulties could be surmounted in some way.

Medical Schools for Women. The medical school for women, formerly conducted by the Southern Methodist Mission at Soochow, has been closed and four of its students have been placed in the North China Union College for Women at Peking. At a recent conference of delegates of the missionary societies interested, with representatives of the Council on Medical Education of the China Medical Missionary Association, it was decided to recommend the establishment of one medical school for women for all of China north of Kwangtung province, the location to be left to the decision of the China Medical Missionary Association in consultation with representatives of the missions interested. It is proposed that this school shall be prepared to give instruction in either Chinese or English. It was also recommended that the missions in the Canton district aid the Hackett Medical College for Women in that city and that the co-operation of the Canton Medical Missionary Union, which is administering the Canton Hospital, be sought. It is likely that the locations which will be most seriously considered for the new school, which is to have the backing of those previously interested in the Peking and Soochow schools, will be Tsinan and Shanghai. The medical faculty of the Shantung Christian University has recently stated its readiness to welcome the women's school and to co-operate with it, if it is thought wise to move to Tsinan.

CHINESE GOVERNMENT MEDICAL SCHOOLS

Medical education as conducted by the Chinese Government has made distinct progress during the past four years, and the development doubtless would have been more rapid if the country had been at peace and if the financial conditions had been normal. The most striking change has been the removal of the Army Medical College from Tientsin to new and spacious buildings in Peking. In the capital, under the eye of the War Department, it should be easier in the future for the school to secure the increased appropriations which it requires. An indication of the serious effort being made to raise the standard is the recent lengthening of the course by the

addition of a fifth year. A certain amount of English is also required. The National Medical College of the Ministry of Education, at Peking, has considerably enlarged its plant in the period under review, and the provincial school at Soochow, one of the best of this type in China, is about to move into new buildings. It is appropriate to mention here that very friendly relations have been maintained between the Peking Union Medical College and the Government schools at Peking. The Government schools have shown us various courtesies, and we have endeavored on our part to reciprocate. It is to be hoped that the presence at Peking of a fully equipped medical school under foreign auspices, will help the authorities of the Government schools to secure from the Government more consideration and more money than they have hitherto received.

OTHER SCHOOLS

The South Manchuria Medical College, maintained at Moukden by the Japanese, is in a flourishing condition and is at present the best equipped and most adequately staffed medical school in China.

As yet no attempt appears to have been made by the Japanese to continue the medical school started by the Germans at Tsingtao. During the war the German Medical School at Shanghai was closed by the French Concession authorities, and the property has been confiscated. The buildings may be used for other educational work under joint control of the French and Chinese authorities. A few of the German doctors were allowed to remain in Shanghai, and with the assistance of some of their earlier Chinese graduates are continuing the instruction of their students at Woosung, below Shanghai, on the Yangtze river.

The French medical school connected with the Aurora University, at Shanghai, is now under way and has secured a few professors, but the director of the university states that its laboratories are not yet equipped. The school of the Hôpital Doumer, at Canton, is also apparently in much the same condition that it was four years ago, with quite inadequate staff and equipment.

PRE-MEDICAL EDUCATION

Fukien Christian University. The Board made in December, 1917, grants amounting to \$163,500 to the Fukien Christian University for the development of pre-medical education, of which \$50,000 was for buildings and equipment, conditioned upon the raising of an additional amount of \$48,000 for the same purpose. There has been some delay in the raising of this sum, but the money is now in hand, plans for the buildings have been prepared by Messrs. Murphy and Dana, and some of the preliminary work on the new site has been already begun.

There has been similar delay in finding the six teachers provided for, the cost of whose support was to be borne in part by the China

Medical Board. This autumn, however, two men have begun teaching: Mr. Norvil Beaman, B.S., M.A., in chemistry, and Mr. J. W. Doolittle, M.A., in physics. Mr. Beaman has been an assistant and tutor at Oberlin and at the University of Chicago, while Mr. Doolittle has been an instructor at the Carnegie Institute of Technology. There were already on the staff Mr. C. F. Kellogg, M.A., in biology, and a Chinese teacher for chemistry.

The first class was admitted to the pre-medical school in February, 1919, with nine students. A two-year course is now planned, but unless the students in Fukien are unusually well prepared a third year will probably be necessary to prepare for our school at Peking.

St. John's University. There has been even more delay in the case of the proposed grant to St. John's University, the only contribution to the pre-medical work there, up to this time, being a fellowship to enable a Chinese teacher of science to go to the United States for graduate work in preparation for teaching in this department upon his return. Arrangements have just been made, however, for the payment of \$60,000 gold towards a total of \$80,000 for a science building, and of \$18,800 for maintenance during four years. Plans for the building have been prepared, and tenders are now being called for.

Ginling College. Grants have just been made to Ginling College, the union college for women at Nanking, of \$12,000 Mex., for the support of a physics teacher for five years and of \$5,000 gold for equipment. In the opinion of the staff of the pre-medical school at Peking, this help should enable Ginling College to prepare students for our medical schools. The biology department there is unusually well conducted.

General Observations. The missions interested in higher education in the Yangtze valley have not yet sent out the commission to make the survey of mission colleges which was intended to precede any further grants to such institutions in the area tributary to Shanghai.

In the meantime, however, the faculties at Nanking and at Shanghai Baptist College have been strengthened by the arrival of new science teachers. A large, new laboratory building is now in use at Nanking, and the Shanghai Baptist College has recently secured funds for a new science building, which is to be erected very soon. Perhaps the most hopeful development in pre-medical education is at Canton, where the academic standards maintained in the Canton Christian College are remarkably high.

At Peking the union university has not yet succeeded in making much progress with the development of its science courses, but the organization of the university is now on a better basis and improvements in the courses will doubtless follow.

Improvement in Middle Schools. There has been a striking improvement in the mission middle schools near Peking, the results

of which will probably be observed in the students applying hereafter for admission to the pre-medical school at Peking. The American Board Mission is concentrating its work of this grade at Tungchow, where a staff of three or four full-time foreign teachers will be employed, whereas formerly the work was divided between four stations, no one of which had a foreign teacher giving all his time to the middle school. The Methodist Mission at Tientsin and the Presbyterian and London Missions at Peking have erected new buildings for their middle schools and are giving much more attention than formerly to this branch of their work.

Aid to Hospitals

The war, with the accompanying disturbance of financial conditions throughout the world and the high cost of all imported supplies, has very seriously interfered with the plans for the improvement of mission hospitals in China. The most serious difficulty has been the withdrawal from China of doctors for military service, and the diversion to war work of doctors and nurses in Great Britain and the United States who might otherwise have offered themselves as candidates for missionary service. In some cases the doctor upon whom depended the planning and carrying out of the proposed improvements went to the war. In other cases the shortage of staff and the pressure of routine duties made it extremely difficult for those who remained to undertake any new constructive activities. The demands of war charities made it hard for the missionary societies to raise their share of the funds needed to make available the grants from the China Medical Board, while the unfortunate tendency of exchange caused even those which had the funds to delay transferring money to China, hoping, as they did, for a return shortly to what had previously been the normal rate.

In spite of these disadvantages there would appear to have resulted already a marked improvement in the condition of hospital work in China, partly as a result of the coming of the China Medical Board.

First of all, the tours of investigation made by the two commissions sent out from the United States, and the report published by the first commission, served to direct attention to the needs of the medical work as nothing before had done. Apart from any suggestions made by representatives of the Rockefeller Foundation, those who were carrying on the work, as a result of the various inquiries and discussions, not only became more dissatisfied with the hard conditions under which they were working, but also began to hope that a way might be provided for better things; and consequently many of them started planning for improvements that had previously seemed unattainable. Undoubtedly the inquiry conducted by the first commission led some to hope for financial help on a larger scale than has seemed to our Board to be possible or wise, and there has

consequently been much disappointment on the part of those whose statements of needs were not followed by appropriations; but some of these, having once made up their minds what they ought to get, have succeeded in securing part at least of the necessary funds from other quarters. In many cases, as a result of the publicity given to their needs, they have succeeded in obtaining more cordial support from their own missions and from their societies at home, for many missionaries in evangelistic or general educational work had not previously realized how far short the medical work was of what it should be, and of what it might be, if their medical colleagues were given the encouragement and support to which their past achievements entitled them.

In accordance with the original plan, the purpose has been to aid first those hospitals which were easily accessible from the medical schools which the Board had decided to develop. This plan was adopted in order that the aid given might not only contribute to the relief of present suffering in China, but might also lead to enlisting the hospitals in the educational campaign. The part to be played by the hospitals was to conserve and carry on the training begun in the schools by giving Chinese doctors facilities for modern medical practice, which they would almost entirely lack if no more attention were given than in the past to their welfare after leaving the medical schools and the school hospitals. One of the principal reasons why greater results have not been obtained from the professional training hitherto given to young Chinese abroad is that so little attention has been devoted to preparing for them the right kind of employment upon their return, as a result of which most of them have had no chance to go through the apprenticeship in practical work under stimulating leadership which forms such an important part of professional training in the West. By providing the right kind of hospitals, near enough to the medical schools so that the hospital staff can be kept constantly stimulated by frequent intercourse with physicians and surgeons engaged in teaching and research, it should be possible hereafter to avoid, so far as the doctors are concerned, much of the wastage among the young graduates that would otherwise be almost inevitable.

PEKING DISTRICT

Since the reorganization of the Peking Union Medical College has been the first important step in the educational program of the Board, it may be appropriate to consider first what has been done in the district tributary to that school.

In the past the medical work in North China had not attained the standard reached farther south, and this is not strange when we consider that the missionary enterprise did not gain a foothold in North China until several decades after it had been firmly established in the south. Besides this, the north is more conservative

and is less exposed than the south to the invigorating influences which come from great commercial centers like Shanghai and Hong-kong; and the people, being poorer, are less able to contribute toward the maintenance of the medical work. This is an important consideration when we remember that many mission hospitals are expected to be self-supporting except for the salaries of the foreign staff. Not only were the hospitals understaffed, and poorly equipped with apparatus for diagnosis and treatment, but many of them did not possess the facilities for meeting the most elementary requirements of cleanliness and sanitation. Patients were admitted without being bathed, and while they were in the hospitals they continued to use, in many cases, their own bedding and clothing, which was usually very far from clean.

In and around Peking the change for the better has been almost revolutionary, and it is now difficult to find a mission hospital anywhere where the newcomer can see conditions as they formerly were nearly everywhere. It is not easy to say just how much of this improvement has been due directly or indirectly to the coming of the China Medical Board. In some cases all or nearly all the funds used were from other sources, and some of the improvements were planned before there was any certainty as to what, if anything, the Board would do. In other cases grants from the China Medical Board and suggestions given by its representatives have played an important part in bringing about the changes.

Methodist Men's Hospital, Peking. An appropriation was made to this hospital for the support of a physician, a dentist, and a nurse. A physician who came out under this grant was appointed to the staff of the Peking Union Medical College, and his place has not yet been filled. The nurse provided for has also not yet been found, although the first appropriation to the North China mission for doctors and nurses was made over four years ago. A very efficient dentist has been secured; however, who came out in 1917 and is now conducting a regular clinic, besides training a class of assistants. The requirements for admission to this dental course are high school graduation or satisfactory completion of two years of the nurses' training course. The hospital has spent from its own funds about \$5,000 Mex. for equipment and building alterations for starting this new department. During the past five years the staff has also been greatly strengthened by the addition of an ophthalmologist and a nurse, who were first supported from hospital earnings, but are now paid by an appropriation from the mission board. This hospital has been entirely transformed during the past four years by means of funds raised independently of the China Medical Board. A good ward building has been built; new beds, bedding, and clothing have been provided; and under the care of an American nurse the wards now present a very neat appearance, entirely different from their aspect when the first commission from the Rockefeller Foundation visited the hospital in 1914. Dr. N. S. Hopkins, the senior physician,

attributes very largely to the interest which the China Medical Board has taken in the institution, the increased share in its expenses which is now provided by the mission. The foreign staff now includes six persons: three doctors, a dentist, an optometrist, and a nurse, as against two, both doctors, in 1914. The mission is planning for another building for this hospital. Appropriations were made in 1915 for additional personnel for the Methodist hospitals at Changli, in Chihli, and Taianfu, Shantung, but as the mission board was not prepared to develop these institutions, the grants have been allowed to lapse.

Methodist Women's Hospital, Peking. This institution also moved into a new building during the period under consideration, the cost in this case again being met quite independently of the China Medical Board. While the Board has made no direct contribution to the hospital, the Peking Union Medical College for two years maintained obstetrical and gynecological wards there, for the instruction of its students, for which altogether, for the two years, \$28,965 Mex., was paid. At the present time this is undoubtedly one of the best conducted women's hospitals in China.

Methodist Women's Hospital, Tientsin. This has also been transformed during the past five years, the old buildings, where the patients were housed under somewhat primitive conditions, having been abandoned, and a fine new hospital in another quarter of the city being erected. This change was well under way before the China Medical Board began operations, but a grant of \$1,500 gold towards a total of \$2,000 helped materially in finishing off the building and providing additional equipment, especially for the laboratory. The increased cost of operating these improved hospitals is not always foreseen and provided for, and this institution has at times been unable to receive patients to its full capacity on account of shortage of staff and lack of current funds with which to insure proper care to additional patients.

American Board Hospital, Tungchow. In former years a very efficient optical work had been developed at this hospital, and when the equipment was sold to the Methodist Hospital in Peking no adequate provision was made for the general medical and surgical work. As a result, this was for a time one of the most depressing hospitals to be seen in China. A small building in European style, sufficient to accommodate some twenty patients, had been erected; but owing to lack of equipment, patients were received in small Chinese buildings, where they lay on brick beds, providing their own clothing, bedding, food, and attendance. There were no kitchen, laundry, bathrooms, or suitable latrines, nor were there any trained nurses, Chinese or foreign. The hospital was so small and there was so little prospect of its being developed into a fully organized institution that it was not deemed wise to recommend any considerable grant from the China Medical Board

toward its improvement. At the same time it seemed highly desirable that an institution representing western medicine, situated so near to Peking and in an educational center of some importance, should be put on a better footing. Accordingly the Peking office rendered every assistance in its power in planning improvements and in raising the funds necessary for carrying them out. The physician in charge, Dr. O. H. Love, partly by practice among foreigners during the summer time, raised a sum of \$9,875 Mex., for remodeling and improving the building and purchasing new equipment. As a result, a very attractive little plant, with modern baths and toilets, hospital kitchen, and laundry, has been created. Neat iron beds were purchased, and a good supply of hospital bedding and clothing was provided. Under the new conditions it was possible to make a far more effective appeal than formerly for the funds necessary for maintaining the hospital, the income and expenditure being increased from \$1,727 to \$3,575 Mex. The annual contributions from the churches at home have been increased from \$697 to \$1,580 Mex. An efficient male nurse, trained at the hospital of the Peking Union Medical College, was employed, and a second was added later. The total direct contribution of the China Medical Board to this hospital has been \$600 gold. This sum was given upon the condition that \$250 toward the maintenance expenses for one year, over and above the regular grants from the American Board, should be raised by other friends of the institution. This hospital has a few rooms which are used for women patients, but it is not yet properly organized for this kind of work. There are now twenty-three beds for men and five for women.

Tientsin Union Hospital. The American Methodist, American Board, and London Missions are planning to establish a union hospital at Tientsin, which will take over the present medical work of the London Mission and put it on a stronger financial basis. The representatives of the China Medical Board have given considerable time to helping the hospital committee with its plans for the organization of the new institution. It is to be hoped that the difficulties in the way of this enterprise may soon be overcome, for Tientsin is now without a good general hospital, and when a well-thought-out project can be put before the public generous support can be certainly secured for it from the Chinese and foreign community.

Moukden Hospital. A grant of \$9,000 gold, and a subsequent allowance of \$7,673.88 Mex., for loss by exchange, have been made to this hospital, with the understanding that the money is to be used for improvements that will not increase its capacity. A new block is being erected, which will permit a better disposal of the patients, with more service rooms than were available before. The United Free Church Mission has contributed £1,200 towards these same improvements. A grant of three fourths of the cost of the support of a nurse was also made by the China Medical Board on condition that

the mission pay the remainder and also provide a second nurse whose support has been promised from other sources. These two nurses are now on their way to China, and two additional doctors are shortly to come out.

American Presbyterian Mission, Men's Hospital, Paotingfu.

One of the most satisfactory investments in mission hospitals has been that at Paotingfu, for which the Board appropriated \$9,877.50 gold, to be used towards improvements in buildings and equipment, the total cost of which was \$6,440 gold and \$15,828 Mex., in addition to the construction of a new building with funds previously received entirely from other sources. The China Medical Board also gave \$4,000 for a doctor's residence.

An additional foreign doctor came out in 1915, under our appropriation, and he has now been at work two years, after two years of preliminary language study. Only one foreign nurse, of two provided for, was secured, and she left to be married after two years of actual service on the field. The business manager, towards whose support we are contributing, has a good knowledge of Chinese and is also something of a mechanic. He has proved invaluable.

Under the energetic direction of Dr. Charles Lewis this hospital has been completely transformed since 1914. The lower floor of the old hospital has been remodeled and devoted to the out-patient department, while the upper floors have been converted into a dormitory for male nurses, with one room for a laboratory. The new building has been painted and decorated, and some cement and terrazzo floors have been laid in the basement and in bathrooms and operating rooms. A heating plant, electric lighting plant, steam sterilizing plant, and hot and cold water systems have been installed. A power house and other out-buildings have been constructed, and quarters have been built for the new doctor and the business manager.

Formerly the patients used their own bedding and clothing, and most of them slept on wooden beds which consisted simply of boards laid on trestles. Now good iron beds of convenient height, and clean hospital bedding and clothing, are provided for all patients. A beginning has been made at keeping histories and records of treatment. The improvement in the nursing, owing to the presence of a trained foreign nurse, has made many of these changes possible.

The annual budget of the hospital now comes to about \$11,000 Mex., not including foreign salaries. This hospital is now receiving from the Peking-Hankow Railway, for treating cases sent to it by that line, \$300 Mex. per month, in addition to the patients' board. For services rendered by the hospital staff during the pneumonic plague in the winter of 1917-1918, the hospital received special grants of \$1,000 each from the railway and from the Ministry of the Interior. The doctors in charge feel that the improved appearance of the hospital and the better work made possible by the larger staff have helped the institution to secure this larger support from Chinese sources.

American Presbyterian Mission, Men's Hospital, Shun-tehfu. Appropriations were made for an additional doctor and for two nurses, \$4,000 for a doctor's residence, \$6,452.93 for improvements in the hospital upon condition that the mission should raise \$2,150.97, and \$750 annually for maintenance upon condition that the mission should increase its grants by \$250. A doctor and one nurse have been found, and the proposed improvements in buildings and equipment have been carried out at a total cost of \$16,252 Mex. This hospital is not so large as that at Paotingfu, but the funds granted have put it on a much better basis than before, with central heating, hot and cold water, baths, flush closets, kitchen, laundry, and bedding and clothing for patients. A new building was erected for the dining room and kitchen, and a small house for the boiler and pumps. A residence for the Chinese doctor and a nurses' dormitory were also provided. The nursing at this hospital has not yet been developed as the staff desires, as the hospital was started later than that at Paotingfu, where some teaching of nurses has been done for several years.

American Board Hospital, Tehchow. A very attractive new building for this institution was being completed when our first grants were made, which provided for two additional doctors, one a woman, and for \$4,633.50 gold for building improvements and equipment. Later, provision was made for an additional nurse, a business manager, a doctor's residence at \$4,000, and \$1,385 annually for current expenses, one-fourth of the cost being borne by the mission. After the disastrous floods of 1917, \$3,300 was granted for repairs and towards the cost of a dike to protect the compound against future floods. All the staff provided for has been found, though one of the doctors left to be married before the expiration of her term, while the nurse and the latest appointee to the business managership have not completed their language study. A training school has been maintained, the latest graduates of which all passed with credit the examinations of the Nurses' Association of China. This is a very active hospital; and as both men and women are received it will be particularly useful not only for training young Chinese doctors but also as an example to other mission hospitals, most of which, in this section, tend to assign their men and women patients to entirely separate institutions.

American Presbyterian Hospital, Chefoo. In some respects this hospital has had, perhaps, higher standards than any other in North China. A member of the staff spent from his private funds a large sum on the initial plant and in some years contributed about \$10,000 Mex. for maintenance. This also is a general hospital and maintains a nurses' training school. The China Medical Board has contributed towards the support of a third doctor and a second nurse, both of whom are at work, and has besides given \$900 towards an electric lighting installation and \$2,250 annually towards current

expenses. The plant is an attractive one, and the large number of critical foreign patients received is an indication of the good work done. The fees collected in the first nine months of 1919 amounted to \$10,669.99 Mex., as against \$2,733.52 in 1914-1915. Donations from Chinese and foreigners increased from \$643.11 in 1914-1915 to \$5,994 Mex., in 1918. Thus the aid given by the China Medical Board has helped the hospital both to earn a larger income by its various services to the community and to make a stronger appeal to other benefactors.

Southern Baptist Hospital, Hwanghien. Grants were made for an additional physician and a nurse, and the mission board provided a second nurse. Unfortunately the nurse appointed under our appropriation died of typhus last year while serving with the American Red Cross in Siberia. The appeal for this emergency service so close at hand was naturally very strong for those who had felt unable to return home for war work, and a large number of doctors and nurses from China, Japan, and Korea responded. The doctor had not been secured at last reports. With the encouragement given by the additions to the working force, many improvements have been already introduced, such as hospital bedding and clothing, routine bathing of patients, a hospital kitchen, and regular nursing. This hospital is at present somewhat inaccessible and is not likely to play such a useful part in the educational program as some others, but the returns for the comparatively small investment made are nevertheless gratifying.

Southern Baptist Hospital, Laichowfu. A grant was made for a second doctor for this hospital, and a woman physician has recently come out. She is now studying the language at Peking. It is expected that two nurses will be added to the staff in 1921. A small building for women patients has been erected with funds received through the mission board, and improved equipment has been secured for eye, ear, nose, and throat work, partly as a result of interest created during the physician's period of special study under a fellowship from the China Medical Board. Part of the funds required for the doctor's residence have been received, and an appropriation has been made for new equipment.

Southern Baptist Hospital, Chengchow. Early in 1916 a grant was made for an additional physician for this hospital, but it was later judged advisable that this help should go to the hospital of the same mission at Yangchow, as the conditions for the development of a really significant work at Chengchow did not then seem favorable. This is, however, an important railroad junction, and should some day be chosen as a strategic location for a really good hospital, if the mission can afford the necessary funds.

English Baptist Hospital, Taiyuanfu. A grant of \$3,150 gold was made to this hospital, to which the mission added \$1,050, for purchasing hospital bedding and clothing and for installing bathrooms

and laundry. While this has been a great improvement, it has not been possible to proceed far with the development of the institution, as there was only one foreign doctor, and he has since died. Mission funds were available to support a second doctor, but the war made it impossible to secure one. It is probable that the heavy burden resting on the one physician, a new arrival with little hospital experience, was in part responsible for his death. Taiyuanfu is the capital of Shansi, and should have a well-staffed and well-equipped hospital. The governor is an unusually progressive man, much interested in public health, especially on account of the fine work done by mission doctors in combating recent plague epidemics. As an evidence of the reality of his interest, it may be noted that he is now supporting several students at the Peking Union Medical College and at the Shantung Christian University Medical School. This province, therefore, offers at the present time an attractive opportunity for developing a medical work that may have far-reaching influence.

Church of the Brethren Mission, Shansi. Small grants of \$250 and \$226.42 gold were made to the hospitals of the Church of the Brethren Mission, which have been recently established at Pingtingchow and Liaochow, Shansi, for the purchase of laboratory equipment. An amount practically equivalent was raised from other sources for the same purpose by the doctors in charge. The Pingtingchow hospital has one doctor and two foreign nurses, while at the Liaochow hospital the foreign doctor has one assistant who graduated at Peking and one foreign nurse.

American Board Mission, Fenchow, Shansi. A very promising work is being developed by the American Board Mission at Fenchow, Shansi, where a fine new hospital is now being completed. While the Board has made no grant to this institution, our Peking office gave some assistance in the preparation of the plans.

London Mission Hospital, Siaochang. Though a grant for the support of a nurse at this hospital was made to the London Mission in 1916, no suitable person has been found as yet. The mission has planned to have two doctors at Siaochang, but has not been able to maintain this standard for some years. Siaochang is a small country town, at some distance from the railway, and there appears to be some uncertainty as to the prospects for developing the work there in the near future.

London Mission Hospital, Tsangchow. In 1918 a grant was made to this hospital for the support of a nurse. Here too the mission ordinarily has two doctors, and the full staff will soon be on the field. Miss Christiansen, who was formerly with the Peking Union Medical College, has been designated as the nurse. A grant of \$600 Mex., was made in the spring of 1919 from the resident director's emergency fund, for the equipment of a bathroom and other service rooms in connection with one women's ward and for the purchase of bedding and clothing for this unit, \$200 being raised for the same purpose

from other quarters. Tsangchow is a small walled city, situated on the Tientsin-Pukou Railway, within eight hours' journey by rail from Peking.

SHANGHAI DISTRICT

Since nearly all missionaries bound for stations in this region land in Shanghai, and most of them go there frequently on business, it will be easy to keep in close touch with the doctors of these hospitals. In general, the plan has been to aid first those hospitals in the immediate vicinity, which could be reached within a day's journey, but for special reasons grants have been made also to a few more remote institutions.

As has been pointed out above, this region has in the past been much more progressive than North China, and partly for this reason there has been a less striking change in the condition of the hospitals during the past four years.

Shanghai. In Shanghai itself practically nothing has been done except to maintain the Red Cross General Hospital for two years, to which reference has been already made. The aid given to the St. John's University Medical School through the support of one member of the staff has, to a certain extent, helped St. Luke's Hospital, of the American Episcopal Mission, by lightening the burden of teaching for the clinical members of the staff. More substantial assistance has been rendered to this institution during the past few years by the Christian Association of the University of Pennsylvania, which has contributed the services of Dr. J. C. McCracken as a member of the clinical staff. A considerable improvement has taken place in the equipment and conduct of the hospital. Plans are now being made for a new hospital building to cost several hundred thousand dollars and for a large increase in staff.

Southern Presbyterian Hospital, Soochow. A grant was made in 1915 for a doctor and a nurse for this hospital, where there were formerly two foreign doctors, both of whom have since retired. The doctor sent out under our grant practically replaced one of these two, so that there has been no real strengthening of the staff. While there has been one gain, through a decision of the mission to cease admitting students to an inferior training school for doctors, which has been maintained in connection with the hospital, it has not been possible to make much positive progress. This hospital receives both men and women patients.

Southern Methodist Hospital, Soochow. Until the end of 1919 the only grants made to this hospital were for the support of a second nurse and for a residence. Both of these grants have been used to the best advantage, much new equipment has been bought with hospital earnings, which in 1918 came to nearly \$24,000 Mex.,

and in addition plans have been completed for a new general hospital that bids fair to be a model of what a mission hospital should be. There is no reason why there should not be many more such, if the missions in general adopt the policy of the Southern Methodist Board, which has apparently decided to concentrate its medical work in a few places and to make it of the highest practicable standard. The mission has undertaken to raise \$142,000 Mex. for this project and to add to the staff two doctors and two nurses, and the China Medical Board has agreed, if the mission makes good its share, to contribute \$50,000 Mex. for the building and in addition to support one doctor and two nurses. There are few hospitals in China where cases, both medical and surgical, receive such careful study and such effective treatment. The staff consists of two foreign doctors and one well-trained Chinese, besides two nurses, one of whom has been absent on Red Cross service in Siberia. The fine teamwork of the staff is a gratifying feature of the organization and one which is unfortunately not so nearly universal as it might be in the mission field. Soochow is such an important point, and the local community is likely to contribute such a large share of the funds needed for maintenance, that it is very much to be hoped that the proposed development of the staff and physical plant may take place soon. Being within two hours' railway journey from Shanghai, it will be possible to maintain between this hospital and the medical school a very intimate relationship which should prove mutually beneficial.

Nanking University Hospital. This hospital for men and women had been maintained since the closing of the medical school of Nanking University, by the co-operation of the Northern and Southern Presbyterian, Northern Methodist, and Christian Missions. The China Medical Board has contributed \$25,000 gold towards a new dispensary building and \$9,250 annually, for maintenance, the missions providing \$25,000 gold additional for the building and \$11,750 per annum for maintenance. A very satisfactory building has been erected, with quarters on the second floor for the resident staff. A good X-ray apparatus is being added to the equipment. Until lately the staff has not been well kept up, owing to the difficulty of securing doctors and nurses during the war, but new recruits have lately come out, and it is hoped that the most difficult time is over. With the comparatively large foreign staff of four doctors, a dentist, four nurses, a laboratory technician, and a secretary, who have now been secured or will shortly arrive, this hospital should be able to give excellent practical experience to young Chinese doctors, as the professional standards of those in charge are high.

Christian Mission Hospital, Nantungchow. Grants were made to this hospital for a second doctor and for a nurse, besides \$3,000 towards the doctor's residence. A very promising physician

was under appointment for this hospital, but he joined the United States Army during the war and was killed in action. A nurse has been secured, who has finished her year of language study. Considerable improvement has been made in the equipment, at a cost of \$4,000 Mex. A Chinese assistant is now in charge of the work during the furlough of the foreign physician. The hospital has wards for both men and women. While the city is not large, it possesses special interest on account of the energy and ability of one of its citizens, who has developed there a unique industrial and educational center, and has become, perhaps, the most influential man in the lower Yangtze valley.

Southern Baptist Hospital, Yangchow. Yangchow, on the Grand Canal, is also very accessible from Shanghai, as it can be reached in less than a day's journey by train and boat. Under Dr. Adrian S. Taylor, who is now professor of surgery at the Peking Union Medical College, and later under his brother, Dr. R. V. Taylor, Jr., a great deal of good surgical work for both men and women, has been done at this hospital. In the past, the mission had planned to have two doctors and one nurse at this station, though as a matter of fact the two doctors have been there together for only short periods. In 1916 a grant was made by the China Medical Board for the support of one additional nurse at Yangchow, and it was later arranged that a physician who had been sent out for Chengchow, Honan, should be sent to Yangchow instead. The hospital has since lost the services of both of these new recruits, the doctor having been accidentally drowned while crossing the Yangtze River and the nurse having married. The nurse formerly supported by the mission has since left active hospital work, so there is now no provision for competent nursing supervision. A second doctor, a Johns Hopkins graduate, who is supported by a church in the United States, came out in the fall of 1919. A third doctor, a young woman who spent her childhood in China and retains some command of the Chinese language, is to be added next year at the expense of the mission board, and search is being made for nurses. The buildings of this hospital were all of light construction, and some were no longer serviceable. There was, therefore, urgent need of a new plant. Accordingly, in 1918, an appropriation of \$45,000 Mex., for new buildings and equipment was made by the China Medical Board on condition that the mission should provide \$15,000 for the same purpose. This condition was met, and the buildings are now under construction, with the prospect that they will be finished in the spring of 1920. The architectural staff of the China Medical Board gave considerable help in the preparation of the plans, and the buildings, though constructed at a very modest cost, seem likely to prove highly useful. Approximately \$66,000 Mex., is being spent, in addition to the use of old materials valued at some \$7,000, local contributions and earnings having

been used to make up the difference. If suitable nurses can be obtained, the outlook for this institution is very promising. Among the urgent needs are a nurses' home, for which land has been already secured, and a matron to relieve the nurses of the burden of the hospital housekeeping.

American Baptist Hospital, Ningpo. A grant was made in 1916 for an additional doctor and a second nurse, and after some delay both of these have been secured. This hospital has a very active service, but there has been little opportunity for change in the work during the period under review, except in the beginning of the training of nurses. There is a movement on foot for combining this institution with that of the Church Missionary Society and building a new hospital. The Church Missionary Society, which formerly had two doctors at Ningpo, now has none, one of them having been killed in the war and the other having decided to remain in England after leaving the army. Its hospital is now being cared for by a private practitioner from the foreign settlement. Ningpo is sufficiently important and accessible to justify the establishment of a good hospital there. It can be reached in a night's journey by steamer from Shanghai. Generous support could be undoubtedly obtained from the Chinese friends of the hospital, as the community is well-to-do.

American Baptist Hospital, Shaohsing. In 1916 a grant was made for an additional foreign doctor, a foreign nurse, and a Chinese business manager, and \$8,512.50 gold was given for the doctor's residence and for other improvements in buildings and equipment, including X-ray, operating room, and laboratory equipment, to which was added \$1,050 in 1918 to meet the increased cost of some of the articles required. The new nurse has been secured, but the doctor has not yet come out. A very attractive house has been built for the Chinese doctor, and a well-appointed laboratory has been fitted up. Both of the doctors at this hospital are much interested in scientific work, and they have made a special study of the numerous parasites of their region. While less than forty patients can at present be accommodated, they are evidently well cared for, and the buildings are kept in the best of order. Some new construction is planned, particularly to relieve the hospital building of the housing of the nurses and to improve, without unduly increasing the number of beds, the facilities for the care of patients.

Southern Presbyterian Hospital, Kashing. The only grant to this hospital has been that of \$2,552.77 gold for the purchase of an X-ray outfit. The apparatus has been received and has evidently been put to good use. This is a large hospital for both men and women, occupying a number of scattered and not very conveniently arranged buildings, which, with the exception of one women's

block, are of light construction. A new hospital is badly needed. The staff has suffered serious losses, first through the transfer of one of the physicians to the Nanking University Hospital, and later when ill health compelled the senior physician to move to Kuling. There is now only one foreign doctor. Funds are available for the employment of another physician as soon as he can be found. The doctor is ably assisted by an American nurse and a secretary or business manager. Kashing is the most important station of the Southern Presbyterian Mission, and the medical work is likely to receive better support when conditions in the United States become more favorable for a canvass for personnel and money. The city is an influential one, strategically located, and can be reached by a journey of one and one-half hours from Shanghai.

Huchow Union Hospital. Huchow is accessible by canal from Soochow and Hangchow and can be reached in less than a day from Shanghai. The Southern Methodist and Northern Baptist Missions have organized a union hospital for men and women, which is at present housed in temporary quarters entirely unsuited to hospital uses. Each mission has had one doctor on the staff. In 1916 the China Medical Board granted \$20,000 gold for a new hospital, on condition that the missions should supply \$28,000, and also contributed three-fourths of the cost of supporting for five years one foreign doctor, one foreign nurse, and a Chinese doctor. The doctors and nurse have been secured, but meanwhile the nurse previously supported by one of the missions has retired. No work has yet been done on the new buildings, owing to the unfavorable exchange, the difficulty experienced in securing a suitable site, and the prolonged absence of the senior physician, Dr. F. P. Manget, who was on Red Cross service in Siberia and for a time was in charge of the medical work of the Siberian Commission. Recently, however, the leading citizens of Huchow have provided, as their contribution to the enterprise, a fine site of about four acres, very conveniently located. During the year 1917-1918 the receipts of the hospital increased 50 per cent.

American Presbyterian Hospital, Hwaiyuan. In 1916 the China Medical Board made an appropriation for the support of one doctor and one nurse at this hospital, where there had previously been two foreign doctors, one of whom was a woman, and one nurse. The sum of \$750 gold per annum was also pledged for general maintenance expenses, and provision was made for a doctor's residence and some small additions to the hospital equipment. With other funds, a women's hospital and a physician's residence have been built, at a cost of \$17,000 gold and \$5,590 Mex., and an endowment of \$50,000 gold has been secured for this department. About \$5,000 Mex. has also been received for a new dispensary. This hospital has been widely known for the high professional standards maintained.

In recognition of the services of the physician in charge, Dr. Samuel Cochran, during the plague epidemic of 1918, grants of \$1,000 Mex. from the Ministry of the Interior and of \$400 from the Tientsin-Pukou Railway were made to the institution. Later a gift of \$1,000 Mex. was received from the military governor of the province. A third doctor has been secured for this hospital, but Doctor Cochran has been obliged to return to the United States on account of his health, and when he returns he is likely to join the faculty of the Shantung Christian University Medical School, so the staff is still incomplete. This hospital can also be reached in a day's journey by train and launch from Shanghai. While the city of Hwaiyuan is comparatively small and unimportant, it is within easy reach of Pengpu, on the Tientsin-Pukou Railway, which is the present seat of the military government of Anhwei Province and is a place of growing commercial importance.

American Methodist Hospital, Wuhu. In 1916 the Board made a grant for the support of a second physician at this hospital, the Methodist Board having decided for the time being to concentrate at that city its efforts for the development of medical work in the lower Yangtze valley. This doctor has now been on the field nearly four years, and the mission has recently added a third. Four nurses have been on the staff at different times, but for various causes their services have been lost to the institution, and two others recently appointed are now studying the language at Nanking. In the spring of 1919 a comprehensive plan for the development of this hospital was adopted by the Methodist Board, and the China Medical Board agreed to co-operate to the extent of bearing one-half the cost of the capital investment, which came to a total of \$80,000 gold, and for five years one-half of the additions to the maintenance expenses, the total increase in the annual budget being nominally \$15,000 gold, but actually \$30,000 Mex. The present buildings are old and most unsatisfactory. Plans are now being prepared for the new hospital which is to be built, and construction will probably begin in 1920. In the past an unusual amount of important surgical work has been done at this hospital, and a good deal of study has been given to local parasitic infections. Wuhu is an open port, and can be reached from Shanghai in a day's journey by train and steamer.

American Episcopal Hospital, Anking. In 1918 an appropriation of \$17,625, conditioned upon the securing of \$5,875 from other sources, was made to this hospital, for nurses' quarters, central heating, plumbing, and other improvements, and in 1919 a grant of \$6,000 Mex. was made for a doctor's residence. Before these larger grants became available, \$150 for laboratory equipment was given from the resident director's emergency fund. Provision was also made for a third foreign doctor, who has not yet been secured, for a secretary, who is already at work, and for an allowance of \$2,000 per

annum for current expenses. There are now on the staff two foreign doctors and four foreign nurses, but one of the doctors has been obliged to leave temporarily to take charge of the hospital of the same mission at Wuchang. For two years there was also on the staff a Chinese doctor who had held one of our fellowships in the United States. This is a large, active hospital, with high standards in all departments of its work. In nursing it is undoubtedly one of the best mission hospitals in China, and its nurses' training school has already turned out some very useful workers. There was some delay on the part of the mission board in securing its share of the funds for building improvements, and consequently it has only recently become possible to begin work on the plans. The hospital has won the recognition of the community to such an extent that it now receives a subsidy of \$300 Mex., per month from the provincial government, of which \$200 comes from the civil authorities and \$100 from the military.

Christian Mission Hospital, Luchowfu (Hofeihsien). This hospital is at present somewhat difficult of access, as it is in the interior of Anhwei province, away from the Yangtze river, and not on any existing railway. It is, however, a very influential city, being the home of some of the most powerful men now in official life in China. A British corporation has been given a contract for the construction of a railway which will bring the city within a day's journey from Shanghai. The Foreign Christian Missionary Society has its strongest station here, and it has determined to make a special effort to establish the hospital on a proper basis, making, at present, its main independent medical work here and at Nantungchow. For most of the time it has had only one foreign doctor on the staff at Luchowfu and no foreign nurse, but even under this disadvantage a large and important work had been developed, and a fairly substantial, though poorly equipped, building had been constructed. In 1915 a grant was made for the support of an additional doctor and a nurse, and later, pending the arrival of the foreign doctor, grants amounting in all to \$896 were made for the salary of a Chinese physician. The doctor and the nurse were secured after some delay, and the doctor is already at work, but the nurse, after her year of language study, has joined the Nanking University Hospital.

In order that additions and improvements in buildings and equipment might be made to put the hospital in good condition for these new workers, fresh from the best hospitals at home, the China Medical Board made in 1918 grants amounting to \$25,500 Mex., towards a total of \$34,000, and contributed further towards the support of a second nurse and a secretary. An allowance of \$4,500 Mex., annually for five years was provided for increased maintenance expenses, to which the mission added \$1,500. The second nurse

and the secretary have not been secured, but an efficient Chinese doctor, who graduated in the United States, has been added to the staff. Meanwhile the physician in charge when the appropriations were made has resigned, and his successor has not yet been secured. The improvements in buildings are now under way, the mission having set aside one of its other workers to plan and supervise these operations.

American Methodist Women's Hospital, Kiukiang. Early in 1919 a grant was made to this hospital for the support of Miss Lillian Wu, a nurse who graduated at the Johns Hopkins Training School while holding a scholarship from the China Medical Board. Miss Wu has already entered upon her duties at Kiukiang, and the hospital has been further strengthened by the arrival of Dr. Phebe Stone, a graduate of the Johns Hopkins Medical School, who has served an internship at the Memorial Hospital, in Worcester. The senior physician, Dr. Mary Stone, is at present in the United States, having been obliged to give up her work for a time on account of ill health. This institution has done very fine work in the past and should become still more useful in the future. An American physician of the same mission, Dr. E. C. Perkins, has started a small work for men in Kiukiang, at a considerable distance from the women's hospital, and during the absence of Dr. Mary Stone he has had certain responsibilities for the women's hospital also. It would probably be an advantage if the men's and women's hospitals could be brought together, in case further development is to take place. This would make possible great economies in buildings and equipment, and should result in increased efficiency in the professional work through the opportunity which would be afforded for greater specialization and for more frequent consultation between the doctors.

MORE REMOTE HOSPITALS

American Presbyterian Hospital, Changteh, Hunan. In 1916 grants were made for the support of an additional nurse and a business manager, the foreign staff previously having consisted of two doctors and one nurse. For improvements in buildings and equipment, \$13,050 gold was given towards a total of \$17,400. In 1918 a grant of \$2,250 gold per annum for five years was pledged towards a total of \$3,000 for increase in the allowance for maintenance. In addition, the Chinese Red Cross Society has lately been contributing \$1,200 Mex., per annum for current expenses. The nurse and the business manager both arrived in 1917 and are now at work in the hospital. Of the grant for improvements in the hospital only about \$5,000 Mex., had been spent up to the end of 1918. The plans for extending the hospital and building a residence were delayed by the high prices of materials and the excessive demands

of the owners of the required land. A considerably larger sum will be needed to effect the improvements that now seem necessary, and it is hoped that a great part at least can be secured through the Inter-Church World Movement. This hospital suffered an irreparable loss in December, 1919, through the death of Dr. O. T. Logan, who was shot by an insane patient only a few months after his return from Red Cross service in Siberia. Dr. Logan was one of the best known missionary physicians in China and one of the most progressive. With the help of Mrs. Logan, who is a trained nurse, he had built up a great work in Changteh and had won the respect of all who knew him.

Church of Scotland Mission Hospital, Ichang. In 1916 a grant was made to the Church of Scotland Foreign Mission Committee, for the support of an additional doctor and a nurse, and \$375 was given towards a total of \$500 gold for additional laboratory and operating room equipment. The staff hitherto has consisted of two doctors and one nurse. The war has until lately prevented securing either the personnel or the equipment desired. Ichang is at the head of navigation for ordinary river steamers on the Yangtze river and is an important trans-shipping point. The journey from Shanghai to Ichang now takes nearly a week under the best conditions. A railway has been planned to run from Hankow to Ichang and from there into Szechwan, but financial conditions have made it necessary to suspend the work of construction. This is the only place in China where the Church of Scotland maintains medical work, and it should, therefore, be able to count on large support from its constituency at home.

Reformed Church in America (Dutch) Hospital, Amoy. In 1917 a plan of reorganization was adopted for this hospital, which seemed likely to result in the development of a high-grade work there, and in the following year grants were made by the China Medical Board for the support of a third physician and of \$2,025 towards a total of \$3,000 gold for a mechanical plant. At last reports, payment under these appropriations had not been called for. Meanwhile one of the physicians left to join the staff of St. Luke's Hospital, Shanghai. With this weakening of the staff, the prospects for further development have become somewhat doubtful. The journey from Shanghai to Amoy takes from three to four days by steamer, the only means of communication likely to be available in the near future.

Canton Hospital. This is an undenominational institution supported by voluntary subscriptions through the Canton Medical Missionary Union. In 1916 the China Medical Board made to it a grant of \$4,500 per annum for five years for the support of a busi-

ness manager and for general maintenance expenses. The Canton Hospital is the oldest and one of the largest hospitals in China, with a budget for 1919 of \$67,800 silver, not including the salaries of four medical missionaries on its full-time staff. In 1919 there were six foreign doctors on the regular staff, of whom two were on furlough. In addition, two private practitioners of Canton have given great help as visiting surgeon and ophthalmologist. For a part of the time the hospital has been without the services of a foreign nurse. There is urgent need of new buildings and new equipment, as well as for a larger annual income, if really modern work of a high standard is to be done and if the generous support of the Chinese community, which is essential to its successful maintenance, is to be won. The question is complicated by a prospective alliance between the Canton Hospital and the Kung Yee Medical School, in accordance with which the medical staff of the Canton Hospital will become teachers in the Kung Yee Medical School. This combination may result in some serious difficulties, but it is stated that only by some such provision for teaching can the institution retain the support of some of the missions which are supporting members of the staff. Whatever individual opinions may be on this subject, it is certainly very desirable that there should be at least one thoroughly modern hospital to represent western medicine in such an important center as Canton.

American Presbyterian Hospital, Kachek, Hainan. The island of Hainan is one of the outlying and relatively isolated fields of mission work in China. A recently arrived physician at Kachek wished to make a practical demonstration, on a small scale, of the advantages of improved hospital practice, with a view to the general introduction of features which had been previously considered financially impracticable. Accordingly a grant of \$1,000 gold was made to him from the resident director's emergency fund, for the equipment of a small, improved ward, where the patients might be cared for in a cleanly and orderly manner, on condition that he should raise elsewhere an equal amount for the same purpose. With this money a six-bed ward is being fitted up with iron beds and a complete outfit of bedding and clothing, a small clinical laboratory is being equipped, some additional surgical instruments have been bought, and an additional helper is being employed for one year. As the money was not given until the spring of 1919, it is still too early to report results.

RESULTS OF AID TO MISSION HOSPITALS

From the foregoing survey it will be seen that the aid given by the China Medical Board has, in some cases, enabled mission hospitals to secure far more generous support both from their own societies and

from the communities in which they are working. Though hitherto most of the grants to mission boards have been in the proportion of three-fourths of the total amount required for the proposed additions to plant or maintenance expenses, the remaining fourth, which the mission provided, has in many cases been much more than its previous grants for similar purposes. In the past year a very encouraging beginning has been made with projects for improvements toward which the mission board contributed half or more than half of the total amount required. The conditional grants have, therefore, fully justified themselves.

The growing appreciation of the real cost of maintaining a creditable medical work has led a few missions to adopt a policy of concentration, in order that in the few places selected a higher standard might be maintained. It would appear also that the professional qualifications of candidates for appointment are being more carefully scrutinized, partly as a result of the inquiry conducted by the China Medical Board into the fitness of doctors towards whose support it is asked to contribute. There is, on the part of the doctors, a marked tendency towards specialization, though with personnel depleted during the war this could not go very far.

A striking testimonial to the success of medical missions is the number of hospitals which secure large subscriptions from their Chinese friends, and it is even more significant that in some cases the need for continued support is recognized by regular monthly or annual payments by government officials or private societies. In the plague epidemic of 1918 the Chinese Government utilized very largely the services of mission doctors and made substantial contributions in recognition of the help received. While gifts from Chinese to foreign medical work are no new thing, we are informed that the more attractive appearance and greater efficiency of certain institutions, due to help received from the China Medical Board, has made it easier to interest new benefactors and to secure larger support from former contributors, just as it has increased the interest of non-medical missionaries in what their medical colleagues are doing.

An attempt has been made to emphasize the importance of improving the nursing in hospitals in China, and distinct progress has been made in this direction, though the number of nurses is still far too small compared with the number of doctors. The difficulty of finding and retaining foreign nurses and women doctors has been made very clear. One board has not yet secured two nurses for whom appropriations were made four and one-half years ago, and the experience of other societies has been much the same. Marriage, ill health, and the claims of families at home constantly cause the withdrawal of women workers even before the expiration of their original agreements. Much time and effort is also required to find men who are willing to come out to China on a missionary basis, and

the number available seems to be small. It is, therefore, becoming evident that even the few existing hospitals in China cannot be adequately staffed unless large numbers of Chinese are trained to take positions of responsibility as well as to take the junior posts.

A successful effort has been made in many cases to place young Chinese doctors in hospitals where the conditions were most favorable for their professional development, even when the salaries were lower than those offered elsewhere. Contrary to the expectation of many missionaries, the influence of institutions supported by the China Medical Board has been in the direction of lower salaries for recent graduates. The salaries paid to internes at Peking are as low as those paid in any mission medical school hospital, and very much lower than those paid by some hospitals to men of no greater experience. The object of this policy has been to emphasize the educational feature of the hospital service and to make it seem an honorable privilege rather than a means of earning money. The improvements brought about by the help of grants from the China Medical Board have enabled some hospitals to make their internships more attractive from a professional point of view, and have thus made it less necessary to pay high salaries.

On the other hand, when these Chinese doctors have satisfactorily completed their period of apprenticeship, and when their qualifications are plainly equal to those of foreign doctors, they should be given due recognition, both in the matter of salary and in responsibility. Even the full missionary salary of the foreign doctor is much less than a good Chinese doctor can earn in private practice, and while his actual cost of living may be somewhat less, there are many claims upon him, as, for example, for the support of dependent relatives, from which most foreigners are exempt. Recognition of full equality of all who are equally qualified promotes *esprit de corps* and deepens the sense of responsibility of the Chinese workers, as has been amply demonstrated by the experience of several missionary organizations. Though the first cost is greater for institutions paying larger salaries to Chinese, it is precisely those organizations that have made the greatest progress in self-support; and in the case of Chinese workers the societies do not have to meet the expense of a period of language study or the traveling expenses of their families during furloughs, which means substantial economies.

Fellowships and Scholarships

Pending the organization of the new medical school and nurses' training school in China, it seemed desirable to help a limited number of Chinese doctors and nurses to carry on special studies in the United States, with a view to their assuming larger responsibilities upon their return to China. During the past four and one-half years, fellowships have been given to twenty-five Chinese doctors, who

have been thus enabled to spend from one to three years in American medical schools and hospitals. Of this number, fourteen have returned to China, and all have found useful employment, in most cases doing work for which a foreign doctor would otherwise be required. Six are on the staff of the Peking Union Medical College, five are, or have until recently been, working at the Hunan-Yale Medical College, one is teaching at the Shantung Christian University Medical School, one is in mission hospital work, and one died after a year of fine service at Changsha. It is gratifying that there has been no tendency, on the part of these young doctors, to go into private practice, their chief interest being in institutional work, particularly teaching. It is largely due to the presence of some of these men that the hospitals at Peking and Changsha have been able to continue effective work during the difficult period of the war, when the foreign staff was so badly depleted. Most of the fellowship holders still remaining in the United States will return to China in 1920, and some of them will doubtless find attractive openings in one of the three medical schools in which the Board is interested, though there is no obligation upon them to do institutional work. One fellowship has been given to a chemist, who had done work of great promise in Boston and wished to remain for another year of study.

As the Peking Union Medical College is now offering ample facilities for study in certain departments, very few fellowships for study abroad are being given at present, and hereafter probably only those who have served some years in the best institutions in China and show special promise will be recommended for foreign study.

Eight scholarships were given to nurses, most of whom, though they had received certain training in China, found it advisable to take the complete training course in the United States. Two of these nurses resigned, one on account of ill health and the other on account of lack of adaptability for nursing. Two others have returned to China, one being employed at the Hunan-Yale Hospital and the other at the Methodist Women's Hospital at Kiukiang. Others will return in 1920. These scholarships not only provide for the new hospitals a few nurses who have a thorough training and an intimate knowledge of Chinese conditions, but they have also served to draw the attention of educated Chinese girls to the nursing profession as an attractive career with great opportunities for usefulness.

Three scholarships have been given to pharmacists, all of whom have returned to China. Two are at present working in the Hunan-Yale Hospital, and one is in charge of the pharmacy at the Shantung Christian University Hospital. The results of this expenditure have thus far been very gratifying.

A large number of fellowships and scholarships have also been given to missionary doctors and nurses on furlough in the United States, preference being given to those in teaching work and to those from hospitals with which the China Medical Board has been

co-operating. Aid has been given thus far to some sixty-four doctors, of whom ten have become members of the staff of the Peking Union Medical College and four are members of the faculty of Shantung Christian University. A few missionary nurses who have received similar aid used it in attending the courses for nurses at Teachers College, Columbia University.

The doctors and nurses who have held these fellowships and scholarships state that they have found great benefit in the periods of study thus made possible. This expenditure has no doubt contributed something of real value to the progress of medical missionary work in China, though it is not easy to measure the results. It will be desirable to continue some form of aid to medical missionaries while they are on furlough, since, after several years of service abroad, it is usually necessary for them to return to the United States for health or family reasons, and hitherto it has been almost impossible for them, with their small salaries, to pay the tuition fees and traveling expenses which are necessary for doctors taking postgraduate courses. Until the autumn of 1919, the Peking Union Medical College was not in a position to offer much to missionary physicians in the way of facilities for graduate study, but as the departments are organized one by one, this side of the work will be emphasized. If these opportunities are to be fully utilized, it will be necessary for the missions to adopt a liberal policy in the matter of periodical leaves of absence for their medical workers, but it is believed that the results will justify the apparent sacrifice.

Co-operation with the China Medical Missionary Association and with other National Organizations

The officers of the Board have endeavored to co-operate in every way possible with the China Medical Missionary Association, the strongest medical organization in China, which includes in its associate membership a considerable number of doctors other than missionaries.

Conference at Peking. The association, which has not met for three years, is holding its next conference in February, 1920, at Peking, in the buildings of the Peking Union Medical College, and several members of the college staff have been giving much of their time during the past few months to making arrangements for the meeting. In addition to the general meetings, in which special attention will be given to the organization and administration of the mission hospitals, there will be sectional conferences each day in anatomy, medicine, general surgery, and eye, ear, nose, and throat. Dr. A. Hrdlicka, of Washington, who comes out under the auspices of the Smithsonian Institution, is to put before the conference a plan for co-operation in scientific anthropological studies in China;

a Japanese worker is coming to read a paper before the anatomical section; and a parasitologist from Manila is being invited to give a paper in the medical section. A grant of \$500 Mex., has been made from the emergency fund of the resident director towards the expenses of compiling the results of a very searching inquiry conducted by Dr. Harold Balme, of the English Baptist Mission and the Shantung Christian University, into the physical equipment, organization, and administration of mission hospitals, the results of which will be laid before the association. It is hoped that an unusually stimulating conference will result from these careful preparations.

Translation and Terminology. Grants amounting to \$10,500 gold have been made during the past three years to the publication committee of the China Medical Missionary Association for translating medical textbooks into Chinese. The total budget during the past year, including the salaries of missionary translators, has been \$13,500 Mex. Among the nine works issued during this period were volumes II to V of Osler and McCrae's *Modern Medicine*, and volumes II and III of Rose and Carless's *Manual of Surgery*. Five other translations were in progress. An American publisher's agent states that the publication of these texts, which are gaining a very considerable circulation, results in a marked increase in the demand for the originals.

Appropriations amounting to \$2,200 gold have been made also to the Nurses' Association of China for the translation of nursing textbooks, which have been used to good advantage.

Friendly relations have been maintained with the National Medical Association of China, which is made up exclusively of Chinese physicians, the leaders of whom have studied in Great Britain and the United States. This association usually holds its meetings at the same time and in the same city with the China Medical Missionary Association, and many of the sessions are combined.

Besides its relations with the medical associations, the Peking office has kept in close touch with other organizations seeking to co-ordinate missionary effort, particularly the China Continuation Committee and the China Christian Educational Association, the officers of which have been very helpful in many ways.

Reference has been already made to the cordial attitude of the Chinese Government towards the Peking Union Medical College. The same friendly feeling has characterized all the Chinese authorities and public bodies with which we have had to deal. While we have not hitherto been in such close touch with the strictly Chinese educational and professional associations as with those under missionary auspices, the officers of the Board and of the Peking Union Medical College have had an opportunity to establish friendly rela-

tions with many Chinese leaders in medical and general educational work at the capital and elsewhere, and as time goes on these relationships should become more intimate and of greater value.

In closing this review, acknowledgment should be made of the uniform courtesy and friendly interest of the American and British Legations, in all matters in which their advice or assistance has been sought.

THE ROCKEFELLER FOUNDATION

Report of the Treasurer

New York, February 3, 1920

To the President of the Rockefeller Foundation:
Sir:

I have the honor to submit herewith my report of the financial operations of The Rockefeller Foundation and its subsidiary organizations for the period January 1, 1919, to December 31, 1919.

Respectfully yours,

L. G. MYERS,
Treasurer.

TREASURER'S REPORT

Income from principal funds and from funds temporarily invested, exclusive of income from special funds, amounted to \$7,090,983.36. The balance of income from the previous year, after adding sundry refunds, was \$5,212,643.47. A total of \$12,303,626.83 was thus available for disbursement, of which the sum of \$7,760,355.21 was disbursed, leaving a balance of \$4,543,271.62.

Of this balance \$3,278,855.64 is applicable to appropriations made in 1919 and prior years, and \$1,264,415.98 is available for appropriation or for disbursement on account of appropriations payable in 1920.

The pledges which become effective in 1920 amount to \$6,085,552.20, while appropriations which become effective in 1921 and subsequent years amount to \$3,112,612.38.

On December 18, 1919, Mr. Rockefeller gave to the Foundation the securities listed in Exhibit P. The Executive Committee voted that this gift should be merged as to principal, investments and income with the other general funds of the Foundation, at a valuation of \$50,438,768.50.

Principal funds, including reserve fund, increased during the year from \$122,293,425.32 to \$174,186,828.46, a difference of \$51,893,403.14, as follows:

Mr. Rockefeller's gift of December	
18, 1919.....	\$50,438,768.50
Gains on securities sold and re-	
deemed.....	1,454,634.64

Income disbursed for land, buildings and equipment increased during the year (after deducting refunds and depreciation) from \$2,513,672.54 to \$4,994,465.84, a difference of \$2,480,793.30. This sum is included in the statement of payments on account of appropriations, and is shown in detail in Exhibit O.

The financial condition and operations are set forth in the appended exhibits listed below:

Balance Sheet.....	Exhibit A
Statements of Receipts and Disbursements of Income.....	Exhibit B
Foundation appropriations:	
War Work.....	Exhibit C
After Care of Infantile Paralysis Cases	Exhibit D
Mental Hygiene.....	Exhibit E
Research in Physics and Chemistry..	Exhibit F
Rockefeller Institute and Medical Education.....	Exhibit G
School of Hygiene and Public Health	Exhibit H
Miscellaneous.....	Exhibit I
International Health Board Appropriations.....	Exhibit J
China Medical Board Appropriations	Exhibit K
Summary of Appropriations and Payments.....	Exhibit L
Statement of Appropriations and Payments of Special Funds.....	Exhibit M
Statements of Principal Funds.....	Exhibit N
Land, Buildings and Equipment Funds	Exhibit O

Transactions Relating to Invested

Funds.....	Exhibit P
Schedule of Securities in General Funds	Exhibit Q
Schedule of Securities in Special Funds	Exhibit R

EXHIBIT A

BALANCE SHEET, DECEMBER 31, 1919

ASSETS

I. INVESTMENTS

General Schedule (Exhibit Q)...	\$175,614,535.40	
Less amount of income investments (see below).....	<u>1,544,506.94</u>	\$174,070,028.46
Special Funds (Exhibit R)....		<u>116,800.00</u>
		<u>\$174,186,828.46</u>

II. LAND, BUILDINGS AND EQUIPMENT (Exhibit O).....

\$4,994,465.84

III. INCOME ACCOUNTS

Income invested temporarily (Exhibit Q).....		\$1,544,506.94
Funds in the hands of agents, to be accounted for, and sundry accounts receivable.....	\$1,451,662.64	
Less accounts payable.....	<u>13,124.35</u>	1,438,538.29
Moneys loaned.....		1,425,000.00
Cash on deposit.....		<u>187,093.02</u>
		\$4,595,138.25

GRAND TOTAL.....

\$183,776,432.55

EXHIBIT A

BALANCE SHEET, DECEMBER 31, 1919

FUNDS AND OBLIGATIONS

I. FUNDS

General Fund (Exhibit N)....	\$171,204,624.50	
Estate Laura S. Rockefeller Fund (Exhibit N).....	152,733.00	
Reserve Fund (Exhibit N)....	2,712,670.96	
		\$174,070,028.46
Special Funds (Exhibit N)....		
Gift of John D. Rockefeller..	\$37,000.00	
Gift of Laura S. Rockefeller..	49,300.00	
Henry Sturgis Grew Mem- orial Fund.....	25,000.00	
Arthur Theodore Lyman En- dowment	5,500.00	
		116,800.00
		<u>\$174,186,828.46</u>

II. LAND, BUILDINGS AND EQUIPMENT FUND

Appropriations from income (Exhibit O).....	<u>\$4,994,465.84</u>
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III. INCOME ACCOUNTS

Estate of Laura S. Rockefeller Fund Income (Exhibit B)...	\$49,763.70	
Henry Sturgis Grew Memorial Fund Income (Exhibit B)...	1,885.70	
Arthur Theodore Lyman En- dowment Income (Exhibit B)	217.23	
Balance payable on appropria- tions (Exhibit L).....	\$3,278,855.64	
*Unappropriated Income.....	1,264,415.98	
		4,543,271.62
		<u>\$4,595,138.25</u>
GRAND TOTAL		<u>\$183,776,432.55</u>

*It should be noted that these figures do not take into account appropriations and pledges payable in 1920 amounting to \$6,085,552.20. If allowance be made for this sum, it follows that appropriations will exceed funds in hand by \$4,821,136.22. Nor are additional appropriations and pledges amounting to \$3,112,612.38, which become effective in 1921 and subsequent years, included in the balance sheet. Both of these liabilities are, for the purposes of this report, considered as charges against the income for the years in which they become payable.

EXHIBIT B

STATEMENT OF RECEIPTS AND DISBURSEMENTS OF INCOME
GENERAL FUNDS

RECEIPTS

Balance, December 31, 1918.....		\$5,189,673.20	
Refunds of payments made in prior years:			
China Medical Board.....	\$453.65		
Foundation.....	22,516.62		
		<u>22,970.27</u>	
Income from principal funds and funds temporarily invested			\$5,212,643.47
			<u>7,090,983.36</u>
Total amount available.....			\$12,303,626.83

DISBURSEMENTS

INTERNATIONAL HEALTH BOARD

(Exhibit G):

Hookworm, malaria and yellow fever work.....	\$625,103.09	
Tuberculosis work in France....	442,281.42	
Medical education.....	22,874.76	
Miscellaneous.....	69,276.37	
Administration.....	78,306.67	
		<u>\$1,237,842.31</u>

CHINA MEDICAL BOARD (Exhibit K):

Medical education:

Peking Union Medical

College:

Land and build-

ings.....\$2,453,457.57

Operation.....355,166.16

Shanghai Medical

School:

Land and build-

ings.....23,651.61

Operation.....2,365.56

Red Cross Hos-

pital:

Operation.....3,727.93

\$2,838,368.83

Unaffiliated medical schools.....69,700.00

Pre-medical education.....23,900.00

Hospitals of missionary societies.127,623.85

Translation of medical and nursing text-books.....5,500.00

<i>Carried Forward</i>	\$3,065,092.68	<u>\$1,237,842.31</u>	<u>\$12,303,626.83</u>
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EXHIBIT B—*Continued*

STATEMENT OF RECEIPTS AND DISBURSEMENTS OF INCOME

GENERAL FUNDS

DISBURSEMENTS (*Continued*)

<i>Brought Forward</i>	\$3,065,092.68	\$1,237,842.31	\$12,303,626.83
Fellowships and scholarships....	\$39,568.88		
Miscellaneous.....	1,642.25		
Administration.....	65,550.13		
	<hr/>	\$3,171,853.94	
WAR WORK (Exhibit L):			
Well-being of soldiers, sailors and prisoners-of-war.....	\$2,625,866.47		
Medical work.....	95,980.95		
Humanitarian work.....	51,000.00		
	<hr/>	2,772,847.42	
AFTER CARE OF INFANTILE PARALY- SIS CASES (Exhibit D).....		6,542.75	
MENTAL HYGIENE (Exhibit E)....		33,353.48	
RESEARCH IN PHYSICS AND CHEM- ISTRY (Exhibit F).....		13,697.55	
ROCKEFELLER INSTITUTE AND MEDI- CAL EDUCATION (Exhibit G)....		76,693.39	
SCHOOL OF HYGIENE AND PUBLIC HEALTH (Exhibit H).....		165,595.11	
MISCELLANEOUS (Exhibit I).....		136,874.01	
ADMINISTRATION (Exhibit J).....		145,055.25	
		<hr/>	
Total expenditures.....		\$7,760,355.21	
BALANCE:			
Securities (Exhibit Q).....	\$1,544,506.94		
Cash on deposit.....	135,226.39		
Moneys loaned.....	1,425,000.00		
Funds in the hands of agents, to be accounted for, and sundry accounts receivable.....	1,451,662.64		
	<hr/>	\$4,556,395.97	
Less accounts payable.....	13,124.35		
	<hr/>	4,543,271.62	
		<hr/>	
		\$12,303,626.83	\$12,303,626.83
		<hr/>	<hr/>

EXHIBIT B—(Continued)

STATEMENT OF RECEIPTS AND DISBURSEMENTS
OF INCOME

SPECIAL FUNDS

LAURA S. ROCKEFELLER FUNDS INCOME

Income collected during the year.....	\$3,000.00
Amounts paid to the several societies designated by Mrs. Rockefeller (Exhibit M)...	<u>\$3,000.00</u>

JOHN D. ROCKEFELLER FUND INCOME

Income collected during the year.....	\$1,850.00
Amounts paid to the several societies designated by Mr. Rockefeller (Exhibit M)....	<u>\$1,850.00</u>

ESTATE LAURA S. ROCKEFELLER FUND INCOME

Balance, December 31, 1918.....	\$39,022.36
Income collected during the year.....	10,741.34
Balance accounted for in cash on deposit....	<u>\$49,763.70</u>

HENRY STURGIS GREW MEMORIAL FUND

Balance, December 31, 1918.....	\$787.08
Income collected during the year.....	1,098.62
Accounted for in cash on deposit.....	<u>\$1,885.70</u>

ARTHUR THEODORE LYMAN ENDOWMENT

Balance, December 31, 1918.....	\$65.41
Income collected during the year.....	151.82
Accounted for in cash on deposit.....	<u>\$217.23</u>

EXHIBIT C

1919 FOUNDATION APPROPRIATIONS,

UNPAID BALANCES OF APPROPRIATIONS MADE IN PREVIOUS YEARS,
AND PAYMENTS THEREON MADE IN 1919

WAR WORK

	PRIOR APPROPRIA- TIONS	1919 APPROPRIA- TIONS	1919 PAYMENTS
WELL BEING OF SOLDIERS, SAILORS, AND PRISONERS-OF-WAR			
American Social Hygiene Association, (R.F. 2330) For demonstration of Social Hygiene program in War Camp Community—1918.....	\$25,000.00	.....	\$6,504.72
(R.F. 2331) For demonstration of Social Hygiene Program in War Camp Community—1919.....	.....	\$10,000.00	.....
(R.F. 2353) For Law Enforcement and Social Hygiene work.....	91,974.91	200,000.00	109,361.75
Teaching of Hygiene to United States Troops			
(R.F. 2346) For demonstration at Camp Meade.....	500.00	.....	.....
Training Camp Auxiliary Fund Com- mittee			
(R.F. 2306) For work during the period January 1 to June 30, 1918	11,106.95	.....	10,000.00
United War Work Fund			
(R.F. 2352) For work of seven co- operating agencies.....	.....	2,500,000.00	2,500,000.00
MEDICAL WORK			
National Committee for Mental Hygiene			
(R.F. 2234) To provide buildings for a Naval Psychiatric Unit....	15,000.00	.....	.....
(R.F. 2370) For War and Recon- struction Work—1919.....	.....	20,000.00	18,916.13
National Research Council			
(R.F. 2319) For support of its Division of Medicine and Re- lated Sciences during the period March 1 to December 31, 1918..	36,143.18	.....	.....
(R.F. 2369) For special work of its Division of Medicine and Re- lated Sciences in connection with the War Emergency and Demob- ilization Period.....	.....	15,000.00	6,312.87

EXHIBIT C—*Continued*

	PRIOR APPROPRIA- TIONS	1919 APPROPRIA- TIONS	1919 PAYMENTS
MEDICAL WORK (<i>Cont'd</i>)			
Rockefeller Institute for Medical Research			
(R.F. 2317) For the operation of its War Demonstration Hospital 1918.....	\$2,164.38	.....	\$2,164.38
(R.F. 2386) For the operation of its War Demonstration Hospital 1919.....	.....	\$55,000.00	40,333.51
(R.F. 2318) For War Research and Relief—1917.....	550.00	.....	.....
(R.F. 2327) For War Research and Relief—1918.....	4,619.15	.....	4,619.15
(R.F. 2343) For War Work—1918	15,570.87	.....	15,570.87
(R.F. 2388) For War Work—1919	.....	5,000.00	3,864.60
(R.F. 2230) For Additional Equipment for teaching Military and Naval surgeons.....	2,635.97	.....	.....
(R.F. 2394) For the preparation of serums at the Princeton Farm—1919.....	.....	10,000.00	4,199.44
HUMANITARIAN WORK			
American Red Cross			
(R.F. 2336) For the maintenance and care of Belgian Children in Switzerland during the period July 1, 1917 to December 31, 1918	52,803.67	.....	25,500.00
(R.F. 2368) For the maintenance and care of Belgian Children in Switzerland—1919.....	.....	51,000.00	25,500.00
War Relief Commission			
(R.F. 2216) Administration—1917	3,334.57	.....	.....
<i>Totals Carried Forward</i>	\$261,403.65	\$2,866,000.00	\$2,772,847.42

TREASURER'S REPORT

359

EXHIBIT C—(Continued)

	PRIOR APPROPRIA- TIONS	1919 APPROPRIA- TIONS	1919 PAYMENTS
<i>Totals Brought Forward</i>	\$261,403.65	\$2,866,000.00	\$2,772,847.42
Unexpended balance of ap- propriations allowed to lapse—			
R.F. 2336 American Red Cross.....	\$27,303.67		
2353 American Social Hygiene Assn....	91,974.91		
2319 National Research Council.....	36,143.18		
2346 Teaching of Hy- giene to U. S. troops.....	500.00		
2306 Training Camp Auxiliary Fund Committee.....	1,106.95		
2234 National Com. for Mental Hygiene	\$15,000.00		
2318 Rockefeller Inst. for Medical Re- search.....	550.00		
	<u>\$172,578.71</u>	.....	.....
R.F. 2331 American Social Hygiene Assn....	\$10,000.00		
2353 American Social Hygiene Assn....	90,638.25		
	.....	<u>\$100,638.25</u>	.....
NET TOTALS.....	<u>\$88,824.94</u>	<u>\$2,765,361.75</u>	<u>\$2,772,847.42</u>
Refunds of amounts disbursed in previous years—			
R.F. 2289 National Commit- tee for Mental Hygiene.....	\$2,308.54		
2307 American Social Hygiene Assn....	8,786.30		
2319 National Research Council.....	803.48		
2346 Teaching of Hy- giene to United States troops....	38.87		
2318 Rockefeller Insti- tute for Medical Research.....	1,871.17		
	<u>\$13,808.36</u>		

EXHIBIT D

AFTER CARE OF INFANTILE PARALYSIS CASES

	PRIOR APPROPRIA- TIONS	1919 APPROPRIA- TIONS	1919 PAYMENTS
After Care of Infantile Paralysis Cases (R.F. 2334, 2391) For administra- tive expenses.....	\$2,945.97	\$3,000.00	\$5,364.99
State Charities Aid Association (R.F. 2290) For work during the year 1918 in co-operation with the New York State Department of Health in providing for the after care of infantile paralysis cases....	4,060.86	.....	1,052.76
(R.F. 2315) For the conduct of clinics by Dr. Robert W. Lovett—1918...	2,000.00	.....	125.00
TOTALS.....	\$9,006.83	\$3,000.00	\$6,542.75
Unexpended balances of appropriations allowed to lapse			
R.F. 2334 Administrative Ex- penses.....	\$580.98		
2290 State Charities Aid Association.....	3,008.10		
2315 State Charities Aid Association.....	1,875.00	5,464.08	.....
NET TOTALS.....	\$3,542.75	\$3,000.00	\$6,542.75

EXHIBIT E

MENTAL HYGIENE

	PRIOR APPROPRIA- TIONS	1919 APPROPRIA- TIONS	1919 PAYMENTS
National Committee for Mental Hygiene (R.F. 2259, 2309, 2360) For the work of the Committee in aiding State Com- missions on provision for the mentally defective.....	\$20,250.00	\$25,000.00	\$13,315.51
(R.F. 2260, 2311, 2361) For studies in the psycho-pathology of crime.....	11,500.00	15,000.00	4,113.43

TREASURER'S REPORT

361

EXHIBIT E—(Continued)

	PRIOR APPROPRIA- TIONS	1919 APPROPRIA- TIONS	1919 PAYMENTS
(R.F. 2308, 2359) For carrying out its surveys of the care and treatment of mental diseases.....	\$9,000.00	\$15,000.00	\$4,137.76
(R.F. 2312, 2362) For the Committee's work in establishing uniform statistics on mental diseases.....	.....	4,000.00	2,786.78
(R.F. 2310) For the support of a Psychiatric Clinic at Sing Sing Prison—1918.....	2,500.00	.....	.....
(R.F. 2363, 2400) For administration expenses.....	.....	11,500.00	9,000.00
TOTALS.....	\$43,250.00	\$70,500.00	\$33,353.48
Unexpended balances of appropriations allowed to lapse			
R.F. 2260 National Committee for Mental Hygiene.....	\$4,000.00		
2311 National Committee for Mental Hygiene.....	7,500.00		
2259 National Committee for Mental Hygiene.....	8,500.00		
2308 National Committee for Mental Hygiene.....	9,000.00		
2309 National Committee for Mental Hygiene.....	11,750.00		
2310 National Committee for Mental Hygiene.....	2,500.00		
	<u>43,250.00</u>	.....	.....
NET TOTALS.....	<u>\$.....</u>	<u>\$70,500.00</u>	<u>\$33,353.48</u>
Refunds of amounts disbursed in previous years			
R.F. 2259 National Committee for Mental Hygiene.....	\$1,604.18		
2308 National Committee for Mental Hygiene.....	6.15		
2309 National Committee for Mental Hygiene.....	3,558.09		
2310 National Committee for Mental Hygiene.....	397.75		
2311 National Committee for Mental Hygiene.....	919.43		
2312 National Committee for Mental Hygiene.....	455.02		
	<u>\$6,940.62</u>		

EXHIBIT F

RESEARCH IN PHYSICS AND CHEMISTRY

	PRIOR APPROPRIA- TIONS	1919 APPROPRIA- TIONS	1919 PAYMENTS
National Research Council (R.F. 2395) For the main- tenance of a system of Na- tional Research Fellow- ships in physics and chem- istry.....	\$.....	\$50,000.00	\$9,680.75
(R.F. 2403) For expenses of the Division of Physical Sciences.....	20,000.00	4,016.80
	<u>\$.....</u>	<u>\$70,000.00</u>	<u>\$13,697.55</u>

EXHIBIT G

ROCKEFELLER INSTITUTE AND MEDICAL EDUCATION

	PRIOR APPROPRIA- TIONS	1919 APPROPRIA- TIONS	1919 PAYMENTS
Rockefeller Institute for Medi- cal Research (R.F. 2385) For additional compensation to em- ployees.....	\$32,000.00	.....	\$30,598.07
Adviser in Medical Education (R.F. 2389) For expenses of trip to South America.	.....	\$14,000.00	9,807.18
Oswaldo Cruz Institute (R.F. 2392, 2416) For trav- eling expenses of Dr. B. C. Crowell from Manila to New York on his trip to South America to take up his duties as Pathologist at the Oswaldo Cruz Insti- tute, Brazil .....	.....	894.33	894.33
University of Chicago (R.F. 2287, 2367) For in- terest on pledges of \$1,- 000,000 for the establish- ment of a Medical School.	2,020.58	50,000.00	35,393.81
<i>Totals Carried Forward.....</i>	<u>\$34,020.58</u>	<u>\$64,894.33</u>	<u>\$76,693.39</u>

TREASURER'S REPORT

363

EXHIBIT G—(Continued)

	PRIOR APPROPRIA- TIONS	1918 APPROPRIA- TIONS	1919 PAYMENTS
<i>Totals Brought Forward</i>	\$34,020.58	\$64,894.33	\$76,693.39
Unexpended balances of appro- priations allowed to lapse			
R.F. 2385 Rockefeller Insti- tute for Medical Research	\$1,401.93		
2389 Advisor in Medical Education		\$4,192.82	
NET TOTALS	<u>\$32,618.65</u>	<u>\$60,701.51</u>	<u>\$76,693.39</u>
Refunds on amounts disbursed in previous years			
R.F. 2245 Rockefeller Institute for Med- ical Re- search	\$8.00		
2350 Rockefeller Institute for Med- ical Re- search	1,759.64		
	<u>\$1,767.64</u>		

EXHIBIT H

SCHOOL OF HYGIENE AND PUBLIC HEALTH

	PRIOR APPROPRIA- TIONS	1919 APPROPRIA- TIONS	1919 PAYMENTS
Johns Hopkins University			
(R.F. 2170) For the establishment and maintenance of a school of hygiene and public health.....	\$217,212.50	.....	\$8,588.49
(R.F. 2242, 2284, 2356) For operating expenses.....	53,006.28	\$162,130.00	132,057.40
(R.F. 2282, 2409) For furniture.....	503.77	12,740.00	.....
(R.F. 2281) For renovating physics laboratory.....	3,047.78	.....	3,047.78
(R.F. 2283) For additional apparatus for physics laboratory.....	23,357.00	.....	10,338.58
(R.F. 2410) For equipment—1919.....	.....	27,791.00	8,876.54
(R.F. 2408) For building alterations 1919.....	.....	19,575.00	607.09
Scholarships or Stipends			
(R.F. 2390) For special work by medical men at the School of Hygiene and Public Health, Johns Hopkins University.....	.....	10,000.00	2,079.23
TOTALS	\$297,127.33	\$232,236.00	\$165,595.11
Unexpended balances of appropriations allowed to lapse			
R.F. 2170 Johns Hopkins Univ...\$7,458.41			
2242 Johns Hopkins Univ... 7,531.10			
2282 Johns Hopkins Univ... 503.77			
2283 Johns Hopkins Univ... 10,846.82			
2284 Johns Hopkins Univ... 10,795.98			
	37,136.08	.....	.....
NET TOTALS	\$259,991.25	\$232,236.00	\$165,595.11

EXHIBIT I

MISCELLANEOUS

	PRIOR APPROPRIA- TIONS	1919 APPROPRIA- TIONS	1919 PAYMENTS
American Academy in Rome (R.F. 215) For general purposes, \$10,000 per year for ten years beginning with 1914. (Installment due 1919).....	\$10,000.00	\$10,000.00
Bureau of Municipal Research (R.F. 265) For constructive studies in the government of the State of New York. \$10,000 per year for five years begin- ning with 1915. (Installment due 1919)	10,000.00	10,000.00
(R.F. 2102) For its New York City work. \$15,000 per year for four years begin- ning with 1916. (Installment due 1919)	15,000.00	15,000.00
Committee of Reference and Counsel of the Annual Foreign Mission Conference of North America (R.F. 228) For carrying out its program of co-operation and co-ordination in foreign missionary work of the prin- cipal American Mission Boards. Total pledge of \$425,000 extending over a period of ten years beginning with 1914. (Installment due 1919).....	45,000.00	45,000.00
Committee for Study of Public Health Nursing (R.F. 2407) For a study in the proper training of public health nurses.....	20,000.00	4,064.47
Committee for Survey of the Condition and Possible Co-operation in the Care of Crippled Children in New York City (R.F. 2426) For the work of the com- mittee.....	7,500.00	481.50
National Organization for Public Health Nursing (R.F. 2364) Toward its budget for the year 1919.....	10,000.00	10,000.00
New York Association for Improving the Condition of the Poor (R.F. 239) For the purpose of providing pensions for dependent widows with families. \$20,000 per year for ten years beginning with 1914. (Balance of installment due 1918).....	\$15,000.00	.....	15,000.00
(Installment due 1919).....	20,000.00	10,000.00
Public Health Committee of New York (R.F. 2333, 2399) For a study of the dispensaries of New York City.....	6,270.84	5,000.00	9,833.44

EXHIBIT I—(Continued)

	PRIOR APPROPRIA- TIONS	1919 APPROPRIA- TIONS	1919 PAYMENTS
War Demonstration Hospital			
(R.F. 2406) To remove the buildings of the hospital from the grounds of the Rockefeller Institute and re-erect them on the farm of the New York City Department of Health in Warwick, New York.....	.....	\$35,000.00	.....
(R.F. 2413) To remove the buildings of the hospital from the grounds of the Rockefeller Institute and re-erect them at such other place or places as may be advisable.....	.....	35,000.00	.....
ASSET ACCOUNTS			
(R.F. 2376) Books for the Library .....	.....	700.00	\$699.93
(R.F. 2415) Furniture and Fixtures.....	.....	6,500.00	6,160.67
(R.F. 2371) Grand Chenier Wild Life Refuge, taxes and expenses.....	.....	3,000.00	634.00
TOTALS.....	\$21,270.84	\$222,700.00	\$136,874.01
Unexpended balances of appropriations allowed to lapse			
R.F. 2406 War Demonstration Hospital.....	\$35,000.00		
2376 Books for Library.....	.07		
2415 Furniture and Fix- tures.....	339.33		
	.....	35,339.40	.....
NET TOTALS.....	\$21,270.84	\$187,360.60	\$136,874.01
ADMINISTRATION			
(R.F. 2384, 2387, 2372, 2377, 2401, 2414) Executive Offices.....	\$6,010.34	\$140,540.00	\$134,169.03
(R.F. 2373) Treasurer's Office.....	.....	17,421.70	10,886.22
TOTALS.....	\$6,010.34	\$157,961.70	\$145,055.25
Unexpended balances of appropriations allowed to lapse			
R.F. 2384 Executive Offices....	436.00		
2373 Treasurer's Office....	\$198.31		
2401 Executive Offices....	222.45		
2372 Executive Offices....	4,765.69		
2377 Executive Offices....	6,337.84		
	.....	11,524.29	.....
NET TOTALS.....	\$5,574.34	\$146,437.41	\$145,055.25

EXHIBIT J

1919 INTERNATIONAL HEALTH BOARD *
APPROPRIATIONS,UNPAID BALANCES OF APPROPRIATIONS MADE IN PREVIOUS YEARS,
AND PAYMENTS THEREON MADE IN 1919

	PRIOR APPROPRIA- TIONS	1919 APPROPRIA- TIONS	1919 PAYMENTS
HOOKWORM WORK			
Southern States			
Alabama			
1918—I.H. 2319, 2320.	\$1,514.02	.....	\$1,300.56
1919—I.H. 2482-2487.	.....	\$15,300.00	2,815.99
Arkansas			
1918—I.H. 2427.....	1,800.00	.....	.....
1919—I.H. 2488.....	.....	3,500.00	.....
Georgia			
1918—I.H. 2323-2325.	8,726.13	.....	3,945.08
1919—I.H. 2490-2494.	.....	12,700.00	.....
Kentucky			
1918—I.H. 2327.....	3,300.00	.....	2,064.97
1919—I.H. 2495.....	.....	3,300.00	.....
Louisiana			
1918—I.H. 2328-2330.	6,357.94	.....	475.87
1919—I.H. 2496-2498.	.....	7,200.00	.....
Maryland			
1918—I.H. 2331.....	2,400.00	.....	352.66
1919—I.H. 2499.....	.....	2,400.00	.....
Mississippi			
1918—I.H. 2332-2338.	13,579.70	.....	8,508.76
1919—I.H. 2563-2583, 2564-2568, 2584-2586, 2623, 2759.....	.....	15,600.00	7,017.61
North Carolina			
1918—I.H. 2288-2292, 2339-2348, 2297-2299, 2300, 2413, 2420-2422, 2407-2409.....	5,682.30	.....	5,682.30
1919—I.H. 2501-2508, 2611, 2641.....	.....	10,751.12	3,279.20
South Carolina			
1918—I.H. 2349-2353.	4,130.75	.....	3,573.13
1919—I.H. 2509-2513, 2592-2593, 2587-2591, 2625-2631.....	.....	26,967.98	9,747.48

* The Foundation provides for the cost of work carried on by the International Health Board by making to the Board one or more appropriations to cover its work for the year. From these large grants the Board then makes its own appropriations for specific objects.

EXHIBIT J—(Continued)

	PRIOR APPROPRIA- TIONS	1919 APPROPRIA- TIONS	1919 PAYMENTS
HOOKWORM WORK (<i>Cont'd</i>)			
Southern States (<i>Cont'd</i>)			
Tennessee			
1918—I.H. 2354-2358.	\$10,000.00	.....	\$6,592.20
1919—I.H. 2514-2518, 2596-2600.....	.....	\$12,212.52	7,250.41
Texas			
1918—I.H. 2359-2364.	9,866.68	.....	7,262.85
1919—I.H. 2519-2523, 2632-2637, 2581....	.....	24,966.69	16,430.23
Virginia			
1918—I.H. 2365-2370.	7,437.21	.....	885.07
1919—I.H. 2569-2572, 2716, 2612, 2624, 2717.....	.....	13,444.44	.....
West Virginia			
1919—I.H. 2750.....	.....	175.00	.....
Central America			
Costa Rica			
1918—I.H. 2371.....	7,118.18	.....	1,732.58
1919—I.H. 2524.....	.....	20,700.00	13,145.03
Guatemala			
1918—I.H. 2372.....	5,983.25	.....	3,330.73
1919—I.H. 2525.....	.....	18,520.00	11,490.28
Nicaragua			
1918—I.H. 2373.....	9,060.80	.....	4,259.94
1919—I.H. 2526.....	.....	21,000.00	11,460.34
Panama			
1918—I.H. 2374.....	10,897.75	.....	5,666.36
1919—I.H. 2527, 2601.	.....	15,565.00	7,478.49
Salvador			
1918—I.H. 2375, 2559.	2,629.06	.....	2,235.30
1919—I.H. 2528.....	.....	12,450.00	8,405.73
South America			
Brazil			
1918—I.H. 2376, 2432, 2378, 2423, 2460, 2377, 2444, 2457, 2381, 2451, 2404, 2379, 2380, 2440	66,168.71	.....	35,808.38
1919—I.H. 2480, 2576- 2577, 2550-2558, 2639, 2622, 2602, 2715, 2579, 2573, 2578, 2613.....	.....	205,679.85	56,809.58

TREASURER'S REPORT

369

EXHIBIT J—(Continued)

	PRIOR APPROPRIA- TIONS	1919 APPROPRIA- TIONS	1919 PAYMENTS
HOOKWORM WORK (<i>Cont'd</i>)			
South America (<i>Cont'd</i>)			
British Guiana			
1918—I.H. 2382.....	\$4,772.63	.....	\$1,997.19
1919—I.H. 2529.....	.....	\$16,027.00	4,404.09
Colombia			
1919—I.H. 2603.....	.....	6,000.00	825.39
Dutch Guiana			
1918—I.H. 2383.....	10,467.58	.....	247.79
1919—I.H. 2582.....	.....	700.00	612.00
British West Indies			
Grenada			
1918—I.H. 2384.....	5,677.70	.....	651.12
Jamaica			
1918—I.H. 2466.....	4,641.00	.....	.....
1919—I.H. 2530.....	.....	11,170.00	2,316.63
St. Lucia			
1918—I.H. 2385.....	2,529.25	.....	1,840.34
1919—I.H. 2531.....	.....	8,408.00	5,879.94
St. Vincent			
1918—I.H. 2386.....	5,716.76	.....	.....
Trinidad			
1918—I.H. 2387, 2560.	3,213.15	.....	1,641.30
1919—I.H. 2533.....	.....	9,020.00	3,944.58
The East			
Australia and Dependencies			
1918—I.H. 2430, 2431, 2561.....	262.13	.....	.....
1919—I.H. 2535, 2642.	.....	15,233.60	4,866.81
Ceylon			
1918—I.H. 2426, 2388, 2219.....	14,716.75	.....	369.62
1919—I.H. 2548, 2534.	.....	18,920.00	6,438.12
China			
1918—I.H. 2438.....	10,156.12	.....	2,363.21
1919—I.H. 2549.....	.....	11,500.00	1,627.19
Egypt			
1915—I.H. 237.....	15,891.88	.....	.....
Federated Malay States			
Hookworm Commission			
1917—I.H. 2220.....	8,997.17	.....	.....
Fiji Islands			
1918—I.H. 2389.....	3,515.37	.....	.....
Seychelles Islands			
1918—I.H. 2419.....	3,485.76	.....	1,424.49
1919—I.H. 2536.....	.....	6,400.00	3,665.34

EXHIBIT J—(Continued)

	PRIOR APPROPRIA- TIONS	1919 APPROPRIA- TIONS	1919 PAYMENTS
HOOKWORM WORK (<i>Cont'd</i>)			
The East (<i>Cont'd</i>)			
Siam			
1918—I.H. 2390.....	\$2,287.47	.....	\$824.78
1919—I.H. 2537.....	.....	\$10,768.43	684.33
Miscellaneous			
Analysis of Records of the United States Army— 2608.....	.....	4,500.00	43.95
Investigation of Sewage Disposal—I.H. 2309...	6,490.59	.....	778.60
Lecture Charts on Hook- worm Disease — I.H. 2248	208.40	.....	12.40
School Charts on Hook- worm Disease — I.H. 2270.....	929.73	.....	.....
MALARIA WORK			
Southern States			
Arkansas			
1919—I.H. 2547.....	.....	1,825.00	178.68
Mississippi			
1918—I.H. 2424, 2450, 2455.....	4,685.47	.....	2,060.74
1919—I.H. 2538, 2545, 2620, 2580.....	.....	24,550.00	6,462.96
YELLOW FEVER WORK			
Yellow Fever Commission			
Ecuador			
1918—I.H. 2452.....	4,858.72	.....	1,285.57
Yellow Fever Control			
Guayaquil, Ecuador			
1918—I.H. 2459.....	19,990.00	.....	4,570.12
1919—I.H. 2539, 2619..	.....	107,544.00	36,387.21
Guatemala			
1918—I.H. 2458.....	14,973.04	.....	5,170.43
Coro, Venezuela			
1918—I.H. 2418.....	5,000.00	.....	.....
Associates of Director Salaries, traveling ex- penses, equipment and supplies I.H.— 2574, 2618.....	.....	45,000.00	27,570.05

TREASURER'S REPORT

371

EXHIBIT J—(Continued)

	PRIOR APPROPRIA- TIONS	1919 APPROPRIA- TIONS	1919 PAYMENTS
YELLOW FEVER WORK (Cont'd)			
Salvador			
1919—I.H. 2575.....	.....	\$1,500.00	\$246.36
ADMINISTRATIVE FIELD STAFF			
Salaries—I.H. 2469, 2764.....	.....	186,000.00	183,808.71
Traveling Expenses—I.H.			
2398, 2471.....	\$34,109.62	40,000.00	37,729.10
Commutation—I.H. 2470,			
2397.....	15,951.93	15,000.00	16,453.67
Medical Examination of			
Applicants I.H. 2477..	.....	250.00	100.00
Drugs for Conserving			
Health—I.H. 2403,			
2476.....	297.50	500.00	76.94
Traveling Expenses of			
Families—I.H. 2446,			
2472.....	1,378.51	8,000.00	6,188.43
Automobiles for Directors			
in Training—I.H. 2475.	.....	3,000.00	.....
Study Leave for Members			
—I.H. 2468, 2713.....	500.00	300.00	347.80
TUBERCULOSIS WORK IN FRANCE			
Central Administration			
1918—I.H. 2415, 2435.	9,034.02	.....	1,370.09
1919—I.H. 2541.....	.....	116,000.00	63,356.20
Medical Division			
1918—I.H. 2416, 2436.	7,155.92	.....	.....
1919—I.H. 2542.....	.....	458,000.00	259,892.00
Educational Division			
1918—I.H. 2417, 2437.	1,220.59	.....	.....
1919—I.H. 2543.....	.....	185,000.00	116,454.80
Additional Compensation			
Director—I.H. 2454...	.....	2,000.00	1,208.33
MEDICAL EDUCATION			
Fellowships			
Bello Horizonte Medical			
School—I.H. 2442,			
2463, 2638.....	2,474.17	150.00	2,461.65
São Paulo—Department of			
Hygiene—I.H. 2456,			
2461, 2610, 2462, 2441.	1,674.93	4,100.00	3,020.89
Public Health—I.H. 2604,			
2712, 2615.....	.....	9,000.00	2,420.69

EXHIBIT J—(Continued)

	PRIOR APPROPRIA- TIONS	1919 APPROPRIA- TIONS	1919 PAYMENTS
MEDICAL EDUCATION (Cont'd)			
Miscellaneous — Brazil— I.H. 2605-2607, 2621..	.....	\$10,350.00	\$2,356.58
Czecho-Slovakian — I.H. 2720-2723.....	.....	9,600.00	2,858.66
São Paulo — Department of Hygiene Initial Equipment—I.H. 2312, 2443.....	\$1,734.95	.....	1,734.95
Operating Expenses 1918—I.H. 2313.....	11,183.76	.....	230.51
1919—I.H. 2467, 2595..	.....	11,050.00	6,124.16
University of Pennsylv- ania—I.H. 2617.....	.....	1,666.67	1,666.67
MISCELLANEOUS			
Editorial Work — I.H. 2479.....	.....	6,000.00	.....
Express, Freight and Ex- change — I.H. 2474, 2401, 2447.....	1,878.21	20,000.00	16,481.34
Field Equipment and Sup- plies—I.H. 2473, 2616, 2777.....	.....	25,000.00	23,434.94
Motor Boat for Dutch Guiana—I.H. 2231....	89.64	.....	.....
Pamphlets and Charts— I.H. 2414, 2478.....	.51	10,000.00	5,487.10
Portable House and Office for use of Director in Salvador—I.H. 2614...	254.65	500.00	476.19
Surveys and Exhibits— I.H. 2540.....	.....	19,800.00	16,870.71
Survey of Public Health Administration in Mas- sachusetts—I.H. 2767..	.....	1,500.00	26.09
Philippine Hospital Ship 1918—I.H. 2428.....	6,500.00	.....	6,500.00
1919—I.H. 2481.....	.....	12,500.00	.....
ADMINISTRATION			
Home Office 1918—I.H. 2562.....	5,242.90	.....	5,017.90
1919—I.H. 2544, 2609, 2766.....	.....	90,587.00	73,288.77

EXHIBIT J—(Continued)

	PRIOR APPROPRIA- TIONS	1919 APPROPRIA- TIONS	1919 PAYMENTS
Balance of funds appropriated by the Rockefeller Foundation for the Board's work during 1919, remaining unappropriated by the International Health Board on December 31, 1919.....		\$219,629.70	.....
TOTALS.....	\$430,800.96	\$2,207,000.00	\$1,237,842.31
Unexpended balances of appropriations and unappropriated balance allowed to lapse.....	266,767.38	282,602.24	.....
NET TOTALS.....	\$164,033.58	\$1,924,397.76	\$1,237,842.31

EXHIBIT K *

1919 CHINA MEDICAL BOARD APPROPRIATIONS,
UNPAID BALANCES OF APPROPRIATIONS MADE IN PREVIOUS YEARS,
AND PAYMENTS THEREON MADE IN 1919

	PRIOR APPROPRIA- TIONS	1919 APPROPRIA- TIONS	1919 PAYMENTS
MISSIONARY SOCIETIES--HOSPITALS			
American Baptist Foreign Mission Society			
(C.M. 276) Ningpo Hospital—Salaries of doctor and nurse. \$2,250 per year for five years, beginning with 1918. (Installment due 1918).	\$2,250.00	.....	.....
(Installment due 1919).	.....	\$2,250.00	.....
(C.M. 277) Shaohsing Hospital — Support of foreign nurse, Chinese business manager and foreign doctor. \$2,475 per year for five years beginning 1918. (Installment due 1918)...	2,475.00	.....	.....
(Installment due 1919).	.....	2,475.00	.....
(C.M. 278) Shaohsing Hospital — Equipment and residences for physician, nurse and Chinese staff	5,625.00	.....	.....
Amer. Board of Commissioners for Foreign Missions			
(C.M. 211, 294) Tehchow Hospital—Salary of two doctors. \$3,236 per year for five years beginning 1915. (Balance due on previous installments).	9,518.50	.....	\$ 790.50
(Installment due 1919).	.....	3,236.00	.....
(C.M. 297, 2229) Tehchow Hospital — Employees' salaries. \$4,152 per year for five years beginning 1916. (Balance due on previous installments).	6,076.15	.....	3,631.87
(Installment due 1919).	.....	4,152.00	.....

* The Foundation provides for the cost of work carried on by the China Medical Board by making to the Board one or more appropriations to cover its work for the year. From these large grants the Board then makes its own appropriations for specific objects.

EXHIBIT K—(Continued)

	PRIOR APPROPRIA- TIONS	1919 APPROPRIA- TIONS	1919 PAYMENTS
MISSIONARY SOCIETIES—HOSPITALS (<i>Cont'd</i>)			
American Board of Commissioners for Foreign Missions (<i>Cont'd</i>)			
(C.M. 2360) Tehchow Hospital — Salary of business manager. \$3,325.88 extending over a period of four years beginning 1918. (Installment due 1919)...	.....	\$950.25	\$475.12
(C.M. 2332) Tehchow Hospital—Repairs and improvements.....	\$1,500.00	.....	1,379.40
(C.M. 2333) Tehchow Hospital—Construction of dike.....	1,800.00	.....	1,616.40
Board of Foreign Missions of the Methodist Episcopal Church			
(C.M. 283, 2176) Wuhu Hospital—Salary and allowance of doctor. \$900 per year for five years beginning 1916. (Balance due on previous installments).....	300.00	.....	.....
(Installment due 1919).....	.....	900.00	.....
(C.M. 2384) Wuhu Hospital—Building of hospital and residences....	.....	40,000.00	.....
(C.M. 223, 2102) Peking Hospital — Salary of doctor. \$2,400 per year for five years beginning 1916. (Balance due on previous installments).....	4,000.00	.....	.....
(Installment due 1919).....	.....	2,400.00	.....
(C.M. 2266) Peking Hospital—Support of dentist, medical practitioner and nurse. \$22,500 extending over a period of five years beginning 1918. (Installment due 1918).....	6,000.00	.....	.....
(Installment due 1919).....	.....	5,250.00	.....

EXHIBIT K—(Continued)

	PRIOR APPROPRIA- TIONS	1919 APPROPRIA- TIONS	1919 PAYMENTS
MISSIONARY SOCIETIES—HOSPITALS (<i>Cont'd</i>)			
Board of Missions of the Methodist Episcopal Church, South			
(C.M. 236, 2105) Soochow Hospital — Salary of nurse. \$600 per year for five years beginning 1916. (Balance due on previous installment)	\$1,200.00	.....	\$600.00
(Installment due 1919). . . . .	.....	\$600.00	.....
Board of Missions of the Methodist Episcopal Church, South—American Baptist Foreign Mission Society, Jointly			
(C.M. 2151) New Union Hospital, Huchow — Building and equipment	20,000.00	.....	.....
(C.M. 2152) New Union Hospital, Huchow — Support of foreign physician. \$5,025 extending over a period of five years beginning 1918. (Installment due 1918).	1,650.00	.....	.....
(Installment due 1919). . . . .	.....	825.00	.....
(C.M. 2153) New Union Hospital — Huchow — Support of foreign nurse. \$3,000 extending over a period of five years beginning 1918. Installment due 1918)	825.00	.....	.....
(Installment due 1919). . . . .	.....	450.00	.....
(C.M. 2154) New Union Hospital, Huchow — Support of Chinese physician. \$2,250 extending over a period of five years beginning 1918. (Installment due 1918).	450.00	.....	.....
(Installment due 1919). . . . .	.....	450.00	.....

EXHIBIT K—(Continued)

	PRIOR APPROPRIA- TIONS	1919 APPROPRIA- TIONS	1919 PAYMENTS
MISSIONARY SOCIETIES—HOSPITALS (<i>Cont'd</i>)			
Board of Foreign Missions of the Presbyterian Church in the U. S. A.			
(C.M. 2144) Changteh Hospital—Current ex- penses. \$2,625 per year for five years beginning 1916 (Balance due on previous installment).. (Installment due 1919)	\$5,531.25 .....	..... \$2,625.00	\$2,587.50
(C.M. 2318) Changteh Hospital—Current ex- penses. \$2,250 per year for five years beginning 1918. (Installment due 1919).....	.....	2,250.00	2,250.00
(C.M. 284) Chefoo Hospi- tal—Salary and allow- ance of doctor and nurse. \$2,625 per year for five years beginning 1917. (Balance due on previous installments). (Installment due 1919).	4,425.00 .....	..... 2,625.00	1,241.20
(C.M. 2243) Chefoo Hos- pital—Operating ex- penses. \$2,250 per year for five years beginning 1918. (Installment due 1919).....	.....	2,250.00	2,250.00
(C.M. 285) Hwaiyuen Hospital—Salary and al- lowance of physician and nurse and operating ex- penses. \$3,375 per year for five years beginning 1918. (Balance due on previous installments). (Installment due 1919).	3,375.00 .....	..... 3,375.00	750.00
(C.M. 286) Hwaiyuen Hospital—Residence of doctor and equipment.	5,250.00	.....	.....

EXHIBIT K—(Continued)

	PRIOR APPROPRIA- TIONS	1919 APPROPRIA- TIONS	1919 PAYMENTS
MISSIONARY SOCIETIES—HOSPITALS (Cont'd)			
Board of Foreign Missions of the Presbyterian Church in the U. S. A. (Cont'd)			
(C.M. 214, 295) Paotingfu —Salaries of doctor and two nurses. Shuntehfu —Salaries of doctor and two nurses. \$9,200 per year for five years be- ginning 1916. (Balance due on previous install- ments).....	\$8,525.00 .....	..... \$9,200.00	\$4,050.00 2,400.00
(Installment due 1919).			
(C.M. 2306) Paotingfu Hospital — Support of business manager. \$900 for five years beginning 1918. (Installment due 1918).....	900.00 .....	..... 900.00	900.00 900.00
(Installment due 1919).			
(C.M. 2142) Shuntehfu Hospital — Mainten- ance. \$750 per year for five years beginning 1916. (Balance due on previous installments).	812.50 .....	..... 750.00	812.50 312.50
(Installment due 1919).			
Board of Foreign Missions of the Reformed Church in America			
(C.M. 2282) Hope and Wilhelmina Hospital— Purchase of pump, well and engine and electric light plant.....	2,025.00.....	..........	..........
(C.M. 2283) Hope and Wilhelmina Hospital— Support of physician. \$1,881 per year for five years beginning 1918 (Installment due 1918).	1,881.00 .....	..... 1,881.00	..........
(Installment due 1919).			

TREASURER'S REPORT

379

EXHIBIT K—(Continued)

	PRIOR APPROPRIA- TIONS	1919 APPROPRIA- TIONS	1919 PAYMENTS
MISSIONARY SOCIETIES—HOSPITALS (Cont'd)			
Canton Christian College			
(C.M. 2139) Canton Hospital—Salary of business manager and current expenses. \$4,500 per year for five years beginning 1917. (Installment due 1919)...	.....	\$4,500.00	\$4,500.00
Church of Scotland Foreign Mission Committee			
(C.M. 288) Ichang Hospital—Equipment.....	\$375.00	.....	.....
(C.M. 289) Ichang Hospital—Support of third foreign doctor and nurse. \$2,250 per year for five years beginning 1918. (Installment due 1918).....	2,250.00	.....	.....
(Installment due 1919).....	.....	2,250.00	.....
Domestic and Foreign Mission Society of the Protestant Episcopal Church in the U. S. A.			
(C.M. 2307) St. James Hospital, Anking—Buildings and equipment...	17,625.00	.....	17,625.00
(C.M. 2308) St. James Hospital, Anking—Operating expenses. \$4,200 per year for five years beginning 1918. (Balance due on previous installment).....	4,200.00	.....	2,175.00
(Installment due 1919).....	.....	4,200.00	.....
(C.M. 2361) St. James Hospital, Anking—Residence of physician.	.....	5,500.00	.....

EXHIBIT K—(Continued)

	PRIOR APPROPRIA- TIONS	1919 APPROPRIA- TIONS	1919 PAYMENTS
MISSIONARY SOCIETIES—HOSPITALS (<i>Cont'd</i>)			
Executive Committee of Foreign Missions of the Presbyterian Church in the U. S., South			
(C.M. 221, 2101) Soochow Salary, outfit and travel to field of foreign nurse. Kashing—Salary, outfit and travel to field of foreign nurse. Salaries \$3,600 per year for five years beginning 1915. (Balance due on previous installments). (Installment due 1919).	\$10,925.00 .....	..... \$3,600.00	\$900.00
Foreign Christian Missionary Society			
(C.M. 2327) Luchowfu Hospital—Buildings and fixed equipment...	18,500.00	.....	13,000.00
(C.M. 2328) Luchowfu Hospital — Movable equipment.....	4,800.00	.....	.....
(C.M. 2329) Luchowfu Hospital — Maintenance. \$4,100 per year for five years beginning 1918. (Installment due 1918)..... (Installment due 1919).	4,100.00 .....	..... 4,100.00	..........
(C.M. 2330) Luchowfu Hospital — Salary of second foreign nurse. \$1,400 per year for five years beginning 1918. (Installment due 1918). (Installment due 1919).	1,400.00 .....	..... 1,400.00	..........
(C.M. 2331) Luchowfu Hospital — Salary of business manager. \$1,400 per year for five years beginning 1918. (Installment due 1918). (Installment due 1919).	1,400.00 .....	..... 1,400.00	..........

TREASURER'S REPORT

381

EXHIBIT K—(Continued)

	PRIOR APPROPRIA- TIONS	1919 APPROPRIA- TIONS	1919 PAYMENTS
MISSIONARY SOCIETIES—HOSPITALS (<i>Cont'd</i>)			
Foreign Christian Missionary Society (<i>Cont'd</i>)			
(C.M. 215, 2100) Luchowfu—Salary and allowance of doctor and nurse. Nantungchow—Salary, and allowance of nurse, \$4,200 per year for five years beginning 1918. (Balance due on previous installment) . .	\$1,005.00	.....	.....
(Installment due 1919) . . . . .	.....	\$4,200.00	.....
(C.M. 2218) Nantungchow Hospital — Support of second physician. \$8,400 extending over a period of five years beginning 1918. (Installment due 1918) . .	1,800.00	.....	.....
(Installment due 1919) . . . . .	.....	1,650.00	.....
(C.M. 2219) Nantungchow Hospital — Residence of doctor	3,000.00	.....	\$3,000.00
Foreign Mission Board of the Southern Baptist Convention			
(C.M. 228, 2106) Chengchow Hospital — Salary of doctor. \$1,200 per year for five years beginning 1916. (Balance due on previous installment)	1,150.00	.....	300.00
(Installment due 1919) . . . . .	.....	1,200.00	.....
(C.M. 281) Hwanghien Hospital — Salary of physician. \$900 per year for five years beginning 1918. (Installment due 1918)	900.00	.....	.....
(Installment due 1919) . . . . .	.....	900.00	.....
(C.M. 282) Hwanghien Hospital — Outfit and travel of physician	750.00	.....	.....

EXHIBIT K—(Continued)

	PRIOR APPROPRIA- TIONS	1919 APPROPRIA- TIONS	1919 PAYMENTS
MISSIONARY SOCIETIES—HOSPITALS (Cont'd)			
Foreign Mission Board of the Southern Baptist Convention (Cont'd)			
(C.M. 225, 2103) Hwang- hien Hospital—Salary of nurse. \$600 per year for five years beginning 1916. (Balance due on previous installment) . . (Installment due 1919).	\$300.00 .....	..... \$600.00	..........
(C.M. 280) Laichowfu Hospital — Equipment and outgoing expenses of physician and wife. .	750.00	.....	.....
(C.M. 279) Laichowfu Hospital — Salary of physician and wife and nurse. \$1,650 per year for five years beginning 1918. (Installment due 1918) (Installment due 1919).	1,650.00 .....	..... 1,650.00	..........
(C.M. 232, 2104) Yang- chow Hospital—Salary of nurse. \$600 per year for five years beginning 1916. (Balance due on previous installment) . . (Installment due 1919).	575.00 .....	..... 600.00	\$150.00
(C.M. 2316) Yangchow Hospital—Land, build- ing and fixed equipment	1,875.00	.....	1,875.00
(C.M. 2317) Yangchow Hospital — Movable equipment.	6,000.00	.....	6,000.00
London Missionary Society			
(C.M. 2167) Siaochang Hospital — Support of nurse. \$600 per year for five years beginning 1918. (Installment due 1918) (Installment due 1919).	600.00 .....	..... 600.00	..........

EXHIBIT K—(Continued)

	PRIOR APPROPRIA- TIONS	1919 APPROPRIA- TIONS	1919 PAYMENTS
MISSIONARY SOCIETIES—HOSPITALS (Cont'd)			
London Missionary Society (Cont'd)			
(C.M. 2326) Tsangchow Hospital — Support of nurse. \$750 per year for five yrs. beginning 1918. (Installment due 1919).	.....	\$750.00	.....
Medical Mission Auxiliary of London (C.M. 2201) Tai Yuan Fu Hospital—Improvements and supplies....	\$3,150.00	.....	.....
United Free Church of Scotland (C.M. 2232) Mukden Hospital—Support of nurse. \$750 per year for five years beginning 1918. (Installment due 1918).	750.00	.....	\$750.00
(Installment due 1919).	.....	750.00	.....
University of Nanking (C.M. 2137) Nanking Hospital — Current expenses. \$9,250 per year for five years beginning 1917. (Installment due 1919).....	.....	9,250.00	.....
Women's Foreign Missionary Society of the Methodist Episcopal Church (C.M. 2359) Kiukiang Hospital — Salary of nurse. \$500 per year for five years beginning 1919. (Installment due 1919).	.....	500.00	157.50
Loss in Exchange (C.M. 2251) To cover loss in exchange on payments during 1917 to Missionary Societies for their hospitals.	10,702.70	.....	3,928.52
(C.M. 2252) To cover loss in exchange on payments during 1918 to Missionary Societies for their hospitals.	91,247.42	.....	26,182.02

EXHIBIT K—(Continued)

	PRIOR APPROPRIA- TIONS	1919 APPROPRIA- TIONS	1919 PAYMENTS
MISSIONARY SOCIETIES—HOSPITALS (Cont'd)			
Loss in Exchange (Cont'd)			
(C.M. 2349) To cover loss in exchange on payments during 1919 to Mission- ary Societies for their hospitals. ....	.....	\$144,115.00	\$20,133.82
FELLOWSHIPS			
Medical Missionaries and Nurses on furlough.	\$12,798.32	13,875.00	16,473.32
Chinese Doctors.	6,329.97	11,000.00	8,227.28
Miscellaneous.	6,560.00	3,000.00	4,519.98
SCHOLARSHIPS			
Students of Harvard Medi- cal School in China.	5,772.24	9,815.33	7,524.26
Chinese Pharmacists.	500.00	.....	400.00
Chinese Nurses.	3,941.02	2,775.00	2,424.04
TRANSLATION			
Publication Committee of the China Medical Mis- sionary Association (C.M. 2309, 2423) Trans- lation of medical and nursing textbooks.	5,500.00	12,000.00	5,500.00
PRE-MEDICAL EDUCATION			
Fukien Christian University (C.M. 2273) Building and equipment for Science Department.	50,000.00	.....	.....
(C.M. 2274) Salaries of six instructors. \$10,000 per year for five years be- ginning 1919. (Install- ment due 1919). ....	.....	10,000.00	10,000.00
(C.M. 2275) Salaries of Chinese instructors. \$2,700 per year for five years beginning 1919 (Installment due 1919). ....	.....	2,700.00	2,700.00
(C.M. 2276) Maintenance of Science Department \$10,000 per year for five years beginning 1919. (Installment due 1919). ....	.....	10,000.00	10,000.00

EXHIBIT K—(Continued)

	PRIOR APPROPRIA- TIONS	1919 APPROPRIA- TIONS	1919 PAYMENTS
PRE-MEDICAL EDUCATION (<i>Cont'd</i>)			
Gingling College			
(C.M.2402) Salary of teacher of physics. \$2,400 per year for five years beginning 1919 (Installment due 1919).		\$2,400.00	.....
(C.M.2403) Purchase of scientific equipment. . . . .	.....	5,000.00	.....
St. John's University			
(C.M.2345) Fellowship for Mr. D. Y. Li. . . . .	.....	1,200.00	\$1,200.00
MEDICAL EDUCATION			
MEDICAL SCHOOLS—UNAFFIL- IATED			
St. John's University of Pennsylvania Medical School			
(C.M.2379) Support of instructor in Medical Department. . . . .	.....	1,500.00	1,500.00
Shantung Christian Univer- sity			
(C.M.252) Expense of ed- ucating students sent to Tsinanfu by the China Medical Board during a period of five years.	\$40,000.00	.....	30,000.00
(C.M.2217, 2358) To cover loss in exchange in connection with ap- propriations C.M.251 and C.M.252.	5,236.55	50,000.00	7,000.00
Yale Foreign Missionary So- ciety			
(C.M.27) Support of Hunan-Yale Medical School, Changsha. \$16,200 per year for five years beginning 1915 (Balance due on previ- ous installment).	8,100.00	.....	8,100.00
(Installment due 1919). . . . .	.....	16,200.00	8,100.00

EXHIBIT K—(Continued)

	PRIOR APPROPRIA- TIONS	1919 APPROPRIA- TIONS	1919 PAYMENTS
MEDICAL EDUCATION (Cont'd)			
MEDICAL SCHOOLS UNAFFIL- IATED—(Cont'd)			
Yale Foreign Missionary So- ciety—(Cont'd)			
(C.M.2230) Support of Hunan-Yale Medical School, Changsha. \$9,000 extending over a period of three years beginning 1917 (Installment due 1918).....	\$3,000.00	.....	\$3,000.00
(Installment due 1919).....	.....	\$2,000.00	.....
(C.M.2231) Support of third instructor in Pre- Medical Department of Hunan-Yale Medical School. \$6,200 extending over a period of three years beginning 1917 (Installment due 1918).....	2,000.00	.....	2,000.00
(Installment due 1919).....	.....	1,500.00	.....
(C.M.2133) Laboratory and equipment at Hunan - Yale Medical School	10,000.00	.....	10,000.00
MEDICAL SCHOOLS—AFFIL- IATED			
Peking Union Medical Col- lege Asset Accounts			
Purchase of additional property (C.M.213, 248, 249, 2170, 2213, 2361).....	33,756.07	65,000.00	12,402.58
Buildings and fixed equip- ment (C.M. 2337, 2354, 2401).....	124,291.57	2,500,000.00	2,296,935.14
Movable Equipment (C.M.2197, 2355).....	23,237.46	300,000.00	40,980.08
Alterations and repairs— Original Building (C.M. 2214, 2338).....	13,089.17	50,000.00	63,089.17
Heavy furniture for staff residences (C.M.2378) .....	.....	15,000.00	611.75
Accessories (C.M.2356).. Library (C.M.2334).....	29,768.41 9,563.66	150,000.00	30,700.20 8,738.65

TREASURER'S REPORT

387

EXHIBIT K—(Continued)

	PRIOR APPROPRIA- TIONS	1919 APPROPRIA- TIONS	1919 PAYMENTS
MEDICAL EDUCATION (Cont'd)			
MEDICAL SCHOOLS — AFFIL- IATED (Cont'd)			
Peking Union Medical Col- lege (Cont'd)			
Operation in China			
Budget 1917-18 (C.M. 2357).....	.....	\$14,000.00	\$12,672.37
Budget 1918-19 (C.M. 2257, 2377).....	\$110,101.98	127,500.00	229,072.45
Budget 1919-20 (C.M. 2341).....	.....	195,000.00	88,156.62
Budget 1917-18 Pre-Medi- cal School (C.M. 2162) ..	24,359.41	.....	193.14
Expenses in America			
July 1, 1918 to June 30, 1919 (C.M. 2258).....	4,815.16	9,500.00	14,315.16
July 1, 1919 to Dec. 31, 1919 (C.M. 2342).....	.....	13,000.00	10,756.42
Red Cross Hospital, Shang- hai Operation			
Budget 1917-18 (C.M. 256, 2248).....	21,011.28	.....	3,727.93
Shanghai Medical School Asset Accounts			
Purchase of land (C.M. 2110, 2429).....	86,530.85	115,000.00	8,508.01
Buildings and fixed equip- ment (C.M. 2270).....	33,151.92	.....	14,880.30
Movable equipment (C. M. 2271).....	5,000.00	.....	.....
Accessories (C.M. 2272) ..	4,969.90	.....	9.66
Library (C.M. 2215).....	2,629.79	.....	253.64
Operation			
Budget 1918-19 (C.M. 2259, 2277, 2289).....	2,193.33	6,000.00	2,365.56
MISCELLANEOUS			
Emergency Fund			
(C.M. 2211, 2383) Aid of medical work of various kinds in China at the discretion of the resi- dent director.....	1,773.58	1,000.00	1,642.25

EXHIBIT K—(Continued)

	PRIOR APPROPRIA- TIONS	1919 APPROPRIA- TIONS	1919 PAYMENTS
ADMINISTRATION			
Home Office			
1918 (C.M. 2260, 2350) ..	\$5,456.40	.....	\$4,698.82
1919 (C.M. 2344, 2382, 2428) .....	.....	\$29,696.00	27,196.51
Peking Office			
1918 (C.M. 2261)	11,719.24	.....	11,584.52
1919 (C.M. 2343, 2405) ..	.....	28,683.00	22,070.28
Balance of funds appropriated by the Rockefeller Foun- dation for the Board's work during 1919, re- maining unappropriated by the China Medical Board on December 31, 1919 .....	.....	82,146.42	.....
TOTALS	\$995,331.80	\$4,140,000.00	\$3,171,853.94
Unexpended balances of ap- propriations and unappro- priated balance allowed to lapse	45,998.79	85,973.54	.....
NET TOTALS ..	<u>\$949,333.01</u>	<u>\$4,054,026.46</u>	<u>\$3,171,853.94</u>
Refunds of amounts disbursed in previous years:			
Home Office Equip- ment	\$442.01		
C.M. 2284 Grace Yoh Fellowship. 11.64			
	<u>\$453.65</u>		

EXHIBIT L

SUMMARY OF APPROPRIATIONS AND PAYMENTS

	PRIOR APPROPRIA- TIONS	1919 APPROPRIA- TIONS	1919 PAYMENTS
INTERNATIONAL HEALTH BOARD....	\$164,033.58	\$1,924,397.76	\$1,237,842.31
CHINA MEDICAL BOARD.....	949,333.01	4,054,026.46	3,171,853.94
WAR WORK.....	88,824.94	2,765,361.75	2,772,847.42
AFTER CARE OF INFANTILE PARALY- SIS CASES.....	3,542.75	3,000.00	6,542.75
MENTAL HYGIENE.....	.....	70,500.00	33,353.48
RESEARCH IN PHYSICS AND CHEM- ISTRY.....	.....	70,000.00	13,697.55
ROCKEFELLER INSTITUTE AND MEDI- CAL EDUCATION.....	32,618.65	60,701.51	76,693.39
SCHOOL OF HYGIENE AND PUBLIC HEALTH.....	259,991.25	232,236.00	165,595.11
MISCELLANEOUS.....	21,270.84	187,360.60	136,874.01
ADMINISTRATION.....	5,574.34	146,437.41	145,055.25
	<u>\$1,525,189.36</u>	<u>\$9,514,021.49</u>	<u>\$7,760,355.21</u>
Prior Appropriations.....		\$1,525,189.36	
1919 Appropriations.....		<u>9,514,021.49</u>	
Total Appropriations.....			\$11,039,210.85
1919 Payments.....			<u>7,760,355.21</u>
Balance payable on Appropriations.....			<u>\$3,278,855.64</u>

EXHIBIT L—(Continued)

In addition to the foregoing, the Foundation has made pledges and appropriations which become effective in future years, and will require for payment the following amounts

YEAR 1920:

INTERNATIONAL HEALTH BOARD....	\$2,500,000.00	
CHINA MEDICAL BOARD.....	2,854,550.00	
MENTAL HYGIENE.....	84,000.00	
RESEARCH IN PHYSICS AND CHEM- ISTRY.....	120,000.00	
ROCKEFELLER INSTITUTE AND MEDI- CAL EDUCATION.....	50,000.00	
SCHOOL OF HYGIENE AND PUBLIC HEALTH.....	199,154.00	
MISCELLANEOUS.....	277,848.20	
		<hr/>
		\$6,085,552.20
YEAR 1921.....		\$1,291,681.25
YEAR 1922.....		265,831.13
YEAR 1923.....		213,350.00
YEAR 1924.....		1,341,750.00
		<hr/>
		<u>\$9,198,164.58</u>

EXHIBIT M

STATEMENT OF APPROPRIATIONS AND PAYMENTS OF SPECIAL
FUNDS FOR THE YEAR 1919

LAURA S. ROCKEFELLER

	APPROPRIA- TIONS	PAYMENTS
(R.F. 2378) Ministers and Missionaries Benefit Board of the Northern Baptist Convention.....	\$500.00	\$500.00
(R.F. 2379) Baptist Home of Northern Ohio.....	500.00	500.00
(R.F. 2380) Euclid Avenue Baptist Church of Cleveland, Ohio.....	1,500.00	1,500.00
(R.F. 2381) Baptist Home for the Aged of New York City.....	500.00	500.00
	<u>\$3,000.00</u>	<u>\$3,000.00</u>

JOHN D. ROCKEFELLER

(R.F. 2382, 2383) Baptist Home for the Aged of New York City).....	<u>\$1,850.00</u>	<u>\$1,850.00</u>
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EXHIBIT N

STATEMENTS OF PRINCIPAL FUNDS

GENERAL FUND

Balance of Mr. Rockefeller's gifts December 31, 1918.....	\$120,765,856.00
Mr. Rockefeller's gift of December 18, 1919.....	50,438,768.50
	<u>\$171,204,624.50</u>

The whole fund is invested in securities listed in General Schedule, Exhibit Q

ESTATE OF LAURA S. ROCKEFELLER FUND

Balance of gifts.....	<u>\$152,733.00</u>
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The whole fund is invested in securities listed in General Schedule, Exhibit Q

RESERVE

Balance December 31, 1918.....	\$1,258,036.32
Gain on securities sold and redeemed during the year.....	1,454,634.64
TOTAL.....	<u>\$2,712,670.96</u>

The whole fund is invested in securities listed in General Schedule, Exhibit Q

LAURA S. ROCKEFELLER FUNDS

Gifts comprising four separate Funds.....	<u>\$49,300.00</u>
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The total of these funds is invested in securities listed in Exhibit R

JOHN D. ROCKEFELLER FUND

Gifts.....	<u>\$37,000.00</u>
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The whole fund is invested in securities listed in Exhibit R

EXHIBIT N—(*Continued*)

HENRY STURGIS GREW MEMORIAL FUND

Gift to Harvard Medical School of China transferred to the Foundation in trust.....	\$25,000.00
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The whole fund is invested in the securities listed in Exhibit R

ARTHUR THEODORE LYMAN ENDOWMENT

Amount received from Harvard Medical School of China and held as a principal fund for Shanghai Medical School.....	\$5,500.00
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The whole fund is invested in securities listed in Exhibit R

EXHIBIT O

LAND, BUILDINGS AND EQUIPMENT FUNDS

Appropriations to December 31, 1918.....		\$2,513,672.54
Deduct refund on China Medical Board equipment	\$442.01	
Depreciation of China Medical Board equipment	176.10	
Depreciation of Foundation equipment.....	3,192.37	3,810.48
		<u>\$2,509,862.06</u>

Moneys paid out of income for year
ending December 31, 1919:

The Rockefeller Foundation:

Furniture and fixtures.....	\$6,160.67	
Books for the library.....	699.93	
Grand Chenier Tract, taxes, etc. . .	634.00	
		<u>7,494.60</u>

China Medical Board:

Peking Union Medical
College:

Additional land.	\$12,402.58	
Buildings and fixed equipment.....	2,296,935.14	
Library.....	8,738.65	
Accessories.....	30,700.20	
Improvements and alterations.....	63,089.17	
Movable equipment	41,591.83	
		<u>2,453,457.57</u>

Shanghai Medical
School:

Land.....	8,508.01			
Buildings and fixed equipment.....	14,880.30			
Library.....	253.64			
Accessories.....	9.66	23,651.61	2,477,109.18	2,484,603.78
				<u>\$4,994,465.84</u>

This fund is represented by the follow-
ing property:

The Rockefeller Foundation:

Grand Chenier Tract (land, taxes, fees, etc.).....	\$243,999.70	
Furniture and fixtures.....	14,849.86	
Library—New York City.....	2,094.90	
		<u>\$260,944.46</u>

<i>Carried Forward</i>	\$260,944.46	\$4,994,465.84
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TREASURER'S REPORT

395

EXHIBIT O—(Continued)

<i>Brought Forward</i>		\$260,944.46	\$4,994,465.84
China Medical Board:			
Peking Union Medical College:			
Original purchase...	\$178,772.77		
Additional land.....	180,087.78		
Buildings and fixed equipment.....	3,872,643.57		
Library.....	23,208.03		
Movable equipment	43,354.37		
Improvements and alterations.....	81,353.92		
Accessories.....	40,931.79		
		4,420,352.23	
Shanghai Medical School:			
Land.....	251,977.16		
Buildings and fixed equipment.....	31,728.38		
Library.....	623.85		
Accessories.....	39.76		
		284,369.15	
Harvard Medical School.....		28,800.00	4,733,521.38
			<u>\$4,994,465.84</u>
			<u>\$4,994,465.84</u>

EXHIBIT P
TRANSACTIONS RELATING TO INVESTED FUNDS
SECURITIES SOLD OR REDEEMED

	NAME	RATE PER CENT.	TOTAL PROCEEDS	
\$175,000.	American Agricultural Chemical Co. First Mortgage...	5	\$180,031.25	Gain
1,000,000.	Bethlehem Steel Co. Two-year Notes.....	5	1,000,000.00	Gain
500,000.	Chicago & Northwestern Ry. Loan participation.....	6	500,000.00	
36,000.	New York Central Lines Equipment Trust.....	4½	36,000.00	Gain
500,000.	Philadelphia Co. Convertible Debenture.....	5	500,000.00	Gain
359,000.	United Kingdom Great Britain & Ireland Three-Year..	5½	350,000.00	Gain
50,000.	Wheeling & Lake Erie R.R. Equipment Trust.....	5	50,000.00	Gain
25.	Shares American Ship Building Co. Common.....		3,362.97	Gain
220.	Shares Chehalis & Pacific Land Co. Dividends aggregating \$4.75 per share in liquidation, credited to cost of stock.....		1,045.00	
2,070.	Shares Chesebrough Manufacturing Co. Capital. Rights sold and proceeds credited to cost of stock...		5,859.70	
648.	Shares Wm. Cramp & Sons Ship & Engine Building Co.		83,051.12	Gain
6,545.	Shares International Agricultural Corporation Preferred		572,732.71	Gain
8,175.	Shares International Agricultural Corporation Common		259,534.25	Gain
15,400.	Shares National Lead Co. Common.....		1,280,699.03	Gain
1,125.	Shares New Orleans, Texas & Mexico Ry.....		45,813.75	Gain
140.	Shares Otis Steel Co. Preferred.....		15,216.83	Gain
329.	Shares Otis Steel Co. Common.....		62,305.65	Gain
304.	Shares Standard Oil Co. (Ohio).....		162,653.04	Gain
1,987.	Shares United States Cast Iron Pipe & Foundry Co. Preferred.....		127,101.58	Gain
			38,790.69	
			Gain	Gain
			\$5,235,406.88	\$1,454,634.64

EXHIBIT P—(Continued)

TRANSACTIONS RELATING TO INVESTED FUNDS—(Continued)

SECURITIES PURCHASED

	NAME	RATE PER CENT.	PRICE PER CENT.	COST
\$2,100,000.	United States Government Second Liberty Loan.....	4½	93.0092	\$1,953,193.40
1,075,000.	United States Government Fourth Liberty Loan.....	4½	93.2134	1,002,044.80
7,500.	Wilson Realty Co. Ten-year First Mortgage.....	6	95.	7,125.00
				<u>\$2,962,363.20</u>

SECURITIES RECEIVED FROM MR. ROCKEFELLER

	NAME	VALUE PER SHARE	BOOK VALUE
366,517	Shares Anglo-American Oil Co., Ltd.....	\$30.50	\$11,178,768.50
10,000	Shares Standard Oil Co. (New Jersey) Non-Voting Cumulative Preferred...	114.50	1,145,000.00
49,000	Shares Standard Oil Co. (New Jersey) Common.....	730.00	35,770,000.00
35,000	Shares Virginia-Carolina Chemical Co. Common.....	67.00	2,345,000.00
			<u>\$50,438,768.50</u>

EXHIBIT Q

SCHEDULE OF SECURITIES IN GENERAL FUNDS ON DECEMBER 31, 1919, REPRESENTING
BOTH PRINCIPAL AND INCOME TEMPORARILY INVESTED

BONDS

NAME	INTEREST RATE PER CENT.	DATE OF MATURITY	AMOUNT	PRICE PER CENT.	CASH PRICE
American Agricultural Chemical Co. First Mortgage Convertible.....	5	Oct. 1928	\$310,000	101.	\$313,100.00
American Telephone & Telegraph Co. Thirty-Year Collateral Trust.....	5	Dec. 1946	100,000	97.75	97,750.00
Anglo-French External Loan.....	5	Oct. 15 '20	600,000	96.0862	576,517.20
Armour & Co. Real Estate First Mortgage.....	4½	June 1939	1,000,000	93.25	932,500.00
Ashland Power Co. First Mortgage.....	5	Mar. 1928	8,000	100.	8,000.00
Atlantic & Birmingham Ry. First Mortgage.....	5	Jan. 1934	677,000	90.	609,300.00
Baltimore & Ohio R.R. Refunding and General Mort- gage.....	5	Dec. 1995	650,000	99.75	648,375.00
Chicago & Alton R.R. Refunding Mortgage.....	3	Oct. 1949	551,000	65.	358,150.00
Chicago & Alton Ry. First Lien.....	3½	July 1950	854,000	53.	452,620.00
Chicago City & Connecting Rys. Collateral Trust.....	5	Jan. 1927	1,305,000	85.	1,109,250.00
Chicago & Eastern Illinois R.R. Refunding and Im- provement Mortgage.....	4	July 1955	300,000	63.	189,000.00
Chicago, Milwaukee & St. Paul Ry. General Mort- gage Series "A".....	4	May 1989	30,000	97.	29,100.00

Chicago, Milwaukee & St. Paul Ry. General Mortgage Series "C".....	4½	May 1989	\$500,000	103.	\$515,000.00
Chicago, Milwaukee & St. Paul Ry. Debenture.....	4	July 1934	450,000	88.2838	397,277.50
Chicago, Milwaukee & St. Paul Ry. General and Refunding Mortgage Series "A".....	4½	Jan. 2014	500,000	91.0625	455,312.50
Chicago & North Western Ry. Extension.....	4	Aug. 15 '26	50,000	95.	47,500.00
Chicago & North Western Ry. Sinking Fund Debenture.....	5	May 1933	80,000	102.	81,600.00
Chicago Railways Co. First Mortgage.....	5	Feb. 1927	500,000	97.	485,000.00
Cleveland, Cincinnati, Chicago & St. Louis Ry. St. Louis Division., Collateral Trust.....	4	Nov. 1990	73,000	90.	65,700.00
Cleveland, Cincinnati, Chicago & St. Louis Ry. General Cleveland Short Line First Mortgage.....	4	June 1993	700,000	83.893	587,250.00
Colorado Industrial Co. First Mortgage.....	4½	Apr. 1961	500,000	95.	475,000.00
Consolidated Gas Co. (New York) Convertible Debenture.....	5	Aug. 1934	2,000,000	80.	1,600,000.00
Dominion of Canada, Government of, Fifteen-Year Erie R.R. General Mortgage Convertible Fifty-Year Series "B".....	6	Feb. 1920	500,000	110.	550,000.00
Illinois Central R.R. Refunding Mortgage.....	5	Apr. 1931	500,000	94.565	472,825.00
Interborough Rapid Transit Co. First Mortgage.....	4	Apr. 1953	1,065,000	74.7175	795,742.30
International Mercantile Marine Co. First and Collateral Trust Sinking Fund.....	4	Nov. 1955	300,000	87.	261,000.00
Lake Erie & Western R.R. Second Mortgage.....	5	Jan. 1966	1,750,000	96.8571	1,695,000.00
Lake Shore & Michigan Southern Ry. First Mortgage.....	6	Oct. 1941	2,848,290	97.5	2,777,082.75
Lake Shore & Michigan Southern Ry. Debenture.....	5	July 1941	100,000	100.	100,000.00
Magnolia Petroleum Co. First Mortgage.....	3½	June 1937	926,000	87.	805,620.00
Missouri, Kansas & Texas Ry. General Mortgage Sinking Fund.....	4	May 1931	1,673,000	92.	1,539,160.00
	6	Jan. 1937	1,809,000	100.	1,809,000.00
	4½	Jan. 1936	1,325,000	84.	1,113,000.00

EXHIBIT Q—Continued
SCHEDULE OF SECURITIES—Continued
BONDS

NAME	INTEREST RATE PER CENT.	DATE OF MATURITY	AMOUNT	PRICE PER CENT.	CASH PRICE
Morris & Essex R.R. First and Refunding Mortgage.					
Mutual Fuel Gas Co. First Mortgage.....	3½	Dec. 2000	\$175,000	82.75	\$144,812.50
National Railways of Mexico, Prior Lien Fifty-Year	5	Nov. 1947	250,000	100.	250,000.00
Sinking Fund with January 1915 and subsequent					
coupons attached.....	4½	July 1957	50,000	59.	29,500.00
Secured 6% Notes for coupon due January 1, 1914		Jan. 1917	1,125	59.	663.75
Guaranty Trust Co. Receipt for July 1, 1914 coupon			1,125	59.	663.75
New Orleans, Texas & Mexico Ry. Non Cumulative	5	Oct. 1935	180,000	42.	75,600.00
Income Series "A".....	4½	Jan. '20-'28	324,000	99.039	320,887.36
New York Central Lines Equipment Trust of 1913...					
New York Central & Hudson River R.R. Thirty-Year	4	May 1934	330,000	88.45	291,885.00
Debenture.....	4	Oct. 1937	35,000	95.	33,250.00
New York, Chicago & St. Louis R.R. First Mortgage	4	May 1931	1,303,000	87.	1,133,610.00
New York, Chicago & St. Louis R.R. Debenture.....	4½	Mar. 1964	100,000	94.5	94,500.00
New York City Corporate Stock.....	4½	Aug. 1953	500,000	95.69073	478,453.65
New York Connecting R.R. First Mortgage.....					
Northern Pacific Ry. Refunding and Improvement	4½	July 2047	390,000	91.577	357,150.00
Mortgage.....	4	May 1948	£2,400	99.	11,880.00
Pennsylvania R.R. Consolidated Mortgage Sterling...	4½	June 1965	\$1,500,000	98.25	1,473,750.00
Pennsylvania R.R. General Mortgage.....					

TREASURER'S REPORT

401

		May 1922	\$1,000,000	97.	\$970,000.00
Philadelphia Co. Convertible Debenture.....	5				
Pittsburgh, Cincinnati, Chicago & St. Louis Ry. Consolidated Mortgage Series "I".....	4½	Aug. 1963	500,000	103.	515,000.00
Province of Quebec Five-Year.....	5	Apr. 1920	500,000	99.75	498,750.00
Reading Co.—Philadelphia & Reading Coal & Iron Co. General Mortgage.....	4	Jan. 1907	500,000	94.25	471,250.00
Rutland R.R. First Consolidated Mortgage.....	4½	July 1941	25,000	90.	22,500.00
St. Louis-San Francisco Ry. Prior Lien Series "A".....	4	July 1950	1,500,000	72.75	1,091,250.00
St. Louis-San Francisco Ry. Adjustment Mortgage.....	6	July 1955	500,000	81.975	409,875.00
Seaboard Air Line Ry. Adjustment Mortgage.....	5	Oct. 1949	455,000	77.	350,350.00
Southern Pacific R.R. First and Refunding Mortgage.....	4	Jan. 1955	100,000	86.	86,000.00
Sunday Creek Co. Collateral Trust.....	5	July 1944	81,000	78.	63,180.00
United Kingdom of Great Britain & Ireland Five-Year Notes.....	5½	Nov. 1921	350,000	98.375	344,312.50
United States Fourth Liberty.....	4½	Oct. 15-'38	1,075,000	93.21347	1,002,044.80
United States Second Liberty converted.....	4¼	Nov. 15-'42	2,100,000	93.00921	1,953,193.40
Wabash R.R. Second Mortgage.....	5	Feb. 1939	120,000	97.8	117,360.00
Washington Ry. & Electric Co. Consolidated Mortgage.....	4	Dec. 1951	450,000	83.5	375,750.00
Western Maryland R.R. First Mortgage.....	4	Oct. 1952	1,032,000	78.8913	814,158.76
Wheeling & Lake Erie R.R. Lake Erie Division First Mortgage.....	5	Oct. 1926	140,000	100.	140,000.00
Wheeling & Lake Erie R.R. Equipment Trust Series "B".....	5	Apr. '20-'27	400,000	99.75	399,000.00
Wilson Realty Co. First Mortgage Bonds.....	6	July 1929	7,500	95.	7,125.00
TOTAL BONDS.....					\$36,279,437.72

EXHIBIT Q—Continued
SCHEDULE OF SECURITIES—Continued
STOCKS

NAME	DIVIDEND RATE PER CENT.	NUMBER OF SHARES	PRICE PER SHARE	CASH PRICE
American Ship Building Co. Preferred.....	7	9,303	85.	\$790,755.00
American Ship Building Co. Common.....	7	14,957	35.	523,495.00
Anglo-American Oil Co., Ltd. (Par £1).....	30	366,517	30.5	11,178,768.50
Atchison Topeka & Sante Fe Ry. Preferred.....	5	5,000	98.25	491,250.00
Atchison, Topeka & Sante Fe Ry. Common.....	6	21,100	95.2563	2,009,908.33
Borne-Scrymser Co. Capital.....	20	300	295.	88,500.00
The Buckeye Pipe Line Co. Capital (Par \$50).....	16	49,693	160.	7,950,880.00
Central National Bank of Cleveland Capital.....	10	500	159.2222	79,611.10
Chehalis & Pacific Land Co. Capital.....		220	36.874	8,112.40
Chesebrough Manufacturing Co. Consolidated Capital.....	14	2,070	220.5025	456,440.30
Chicago City & Connecting Ry. Participation Certificates Preferred.....				
Chicago City & Connecting Ry. Participation Certificates Common.....		17,530	69.1875	1,212,856.88
Cleveland Arcade Co. Capital.....	8	10,518	30.	315,540.00
Cleveland Trust Co. Capital.....	12	2,500	98.6222	246,555.56
Colorado & Southern Ry. First Preferred.....	4	286	238.195	68,123.77
Consolidated Gas Co. of N. Y. Capital.....	7	7,000	54.	378,000.00
The Continental Oil Co. Capital.....	12	20,000	127.50	2,550,000.00
		7,000	190.	1,330,000.00

The Crescent Pipe Line Co. Capital (Par \$50).....	6	14,120	60.	847,200.00
Cumberland Pipe Line Co. Capital.....	12	3,000	81.333	244,000.00
Erie R. R. First Preferred.....		21,400	45.8306	980,773.76
Eureka Pipe Line Co. Capital.....	16	12,357	361.3333	4,454,995.59
Galena-Signal Oil Co. Preferred.....	8	4,193	139.7	555,779.50
Galena-Signal Oil Co. Common.....		20,000	189.7031	3,794,959.59
Great Lakes Towing Co. Preferred.....	7	1,527	88.7361	135,500.05
Great Lakes Towing Co. Common.....	5	1,200	12.	14,400.00
Indiana Pipe Line Co. Capital (Par \$50).....	16	24,845	125.111	3,108,385.28
Manhattan Ry. Capital.....	7	10,000	128.775	1,287,750.00
Missouri Pacific R.R. Voting Trust Certificates for Convertible Preferred.....		21,980	55.5	1,219,890.00
National Lead Co. Preferred.....	7	1,100	104.	114,400.00
National Lead Co. Common.....	5	14,000	50.	700,000.00
National Transit Co. Capital (Par \$12.50).....	16	126,481	28.5	3,604,708.50
New York, Chicago & St. Louis R.R. Second Preferred.....		400	78.70	31,480.00
New York, Chicago & St. Louis R.R. Common.....		100	55.	5,500.00
New York Transit Co. Capital.....	16	12,392	300.	3,717,600.00
Northern Pacific Ry. Capital.....	7	700	91.7625	64,233.75
Northern Pipe Line Co. Capital.....	10	9,000	110.	990,000.00
Pere Marquette Ry. Preferred.....		5,740.8	54.565	313,248.00
Provident Loan Society Certificates (Par \$5,000).....	6	40	100.	200,000.00
Seaboard Air Line Ry. Preferred.....		4,300	54.	232,200.00
Seaboard Air Line Ry. Common.....		3,400	21.	71,400.00
Sheffield Farms Co., Incorporated, Preferred.....	6	150	99.4	14,910.00
The Solar Refining Co. Capital.....	10	4,964	185.007	918,375.00
Southern Pipe Line Co. Capital.....	20	24,845	229.5556	5,703,308.88
South West Pennsylvania Pipe Lines Capital.....	12	8,000	160.	1,280,000.00
Standard Oil Co. (Indiana) Capital.....	24	29,718	867.	25,765,506.00

EXHIBIT Q—Continued
SCHEDULE OF SECURITIES—Continued
STOCKS—Continued

NAME	DIVIDEND RATE PER CENT.	NUMBER OF SHARES	PRICE PER SHARE	CASH PRICE
The Standard Oil Co. (Kansas) Capital.....	24	4,966	275.016	\$1,365,733.13
Standard Oil Co. (Kentucky) Capital.....	12	14,868	70.2547	1,044,547.23
Standard Oil Co. (Nebraska) Capital.....	20	2,482	270.	670,140.00
Standard Oil Co. (New Jersey) Preferred.....	7	10,000	114.5	1,145,000.00
Standard Oil Co. (New Jersey) Common.....	20	49,000	730.	35,770,000.00
The Standard Oil Co. (Ohio) Capital.....	16	17,088	210.	3,588,480.00
Superior Savings & Trust Co. Capital.....	16	300	297.8333	89,350.00
Tilden Iron Mining Co. Capital.....		1,780	27.35	48,683.46
Union Tank Line Co. Capital.....	7	24,000	70.	1,680,000.00
Virginia-Carolina Chemical Co. Common.....	6	35,000	67.	2,345,000.00
Washington Oil Co. Capital (Par \$10).....		1,774	30.	53,220.00
Western Maryland Ry. Second Preferred.....		500	46.	23,000.00
Western Pacific R.R. Corporation Preferred.....	4	20,195	43.5	878,482.50
Western Pacific R.R. Corporation Common.....		30,292 1/2	15.25	461,960.62
Wilson Realty Co. Capital.....		591	100.	59,100.00
Woman's Hotel Co. Capital.....		300	80.	24,000.00
TOTAL STOCKS.....				\$139,335,097.68

SUMMARY

Bonds.....	\$36,279,437.72
Stocks.....	139,335,097.68
Total book value of investments belonging to General Funds, principal and income.....	\$175,614,535.40
The foregoing investments are apportioned as follows:	
General Fund.....	\$171,204,624.50
General Fund Income.....	1,544,506.94
Estate Laura S. Rockefeller Fund.....	152,733.00
Reserve.....	2,712,670.96
TOTAL.....	\$175,614,535.40

EXHIBIT R
SCHEDULE OF SECURITIES IN SPECIAL FUNDS ON DECEMBER 31, 1919
JOHN D. ROCKEFELLER FUND
BONDS

NAME	RATE %	DATE OF MATURITY	AMOUNT	PRICE %	CASH PRICE
Canada Southern Ry. Consolidated Mortgage Series "A"	5	Oct. 1962	\$37,000	100.	\$37,000.00

LAURA S. ROCKEFELLER FUND
BONDS

Colorado Industrial Co. First Mortgage.....	5	Aug. 1934 Dec. 1923	\$50,000	80.	\$40,000.00
Virginia Carolina Chemical Co. First Mortgage.....	5		10,000	93.	9,300.00

HENRY STURGIS GREW MEMORIAL FUND
BONDS

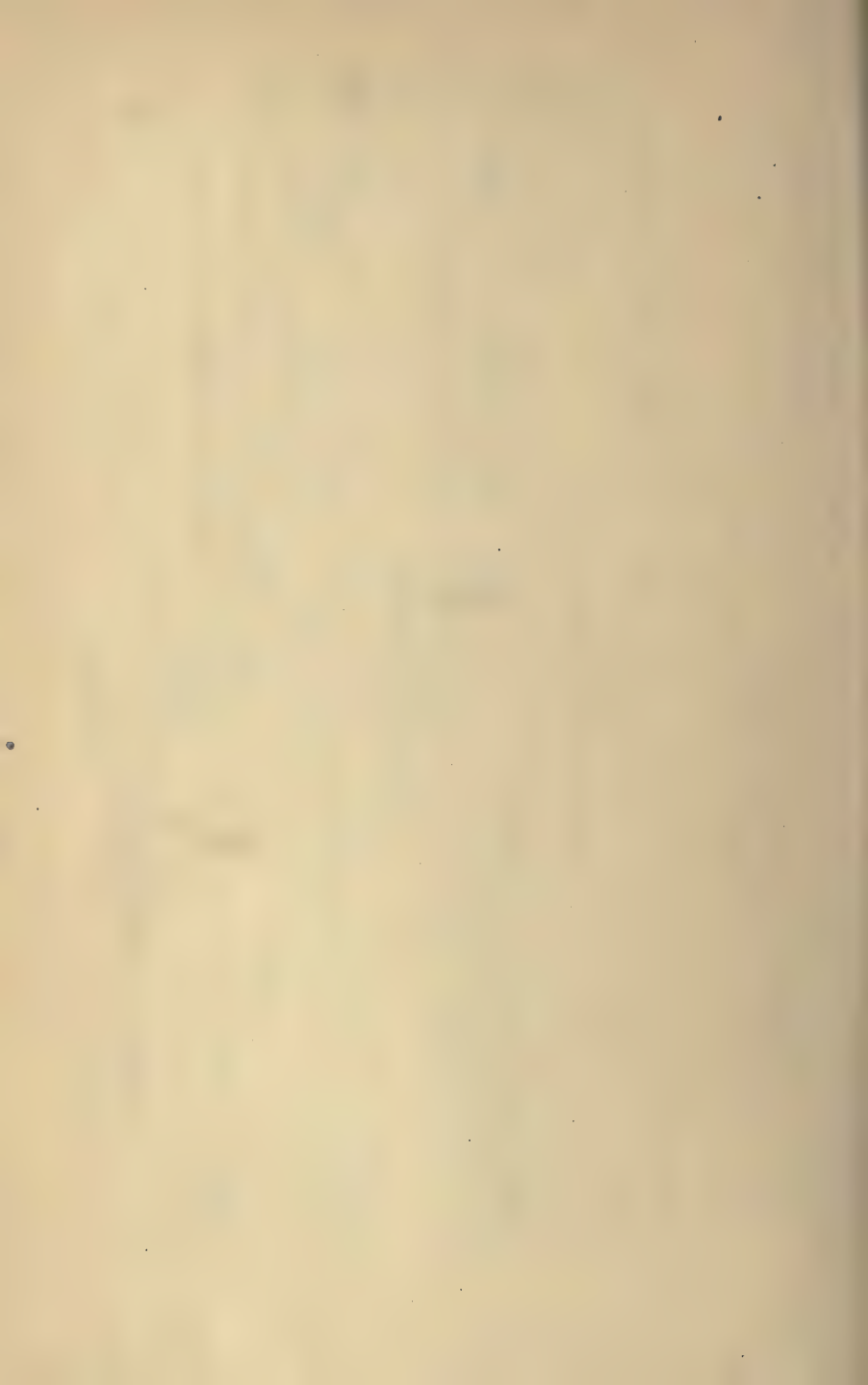
United States Second Liberty Loan Converted.....	4 1/4	Nov. 15 '42	\$25,850	96.71167	\$25,000.00
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ARTHUR THEODORE LYMAN ENDOWMENT
BONDS

United States Fourth Liberty Loan.....	4 1/4	Oct. 15 '38	\$5,850	94.01709	\$5,500.00
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601

INDEX



INDEX

	PAGE
ADAMS, HENRY	272
AFRICA, WEST COAST OF	11, 20
AGAR, JOHN J.	55
AISNE, FRANCE	236
ALABAMA:	
Relief and control of hookworm disease	98
Anti-mosquito measures for malaria control	220
Also	80
ALABAMA STATE BOARD OF HEALTH	114
ALAJUELA COUNTY, COSTA RICA	209
ALTITUDE:	
Effect on hookworm infection	130
ALVES, DR. J. T.	171-172
AMAPALA, HONDURAS	233
AMEBIC DYSENTERY, <i>see</i> DYSENTERY.	
AMERICAN BAPTIST HOSPITAL, NINGPO, CHINA	331
AMERICAN BAPTIST HOSPITAL, SHAOHSING, CHINA	331
AMERICAN BOARD HOSPITAL, TEHCHOW, CHINA	295, 325
AMERICAN BOARD HOSPITAL, TUNGCHOW, CHINA	322-323
AMERICAN BOARD MISSION, FENCHOW, SHANSI, CHINA	327
AMERICAN EPISCOPAL HOSPITAL, ANKING, CHINA	295, 333-334
AMERICAN EPISCOPAL MISSION, SHANGHAI, CHINA	328
AMERICAN METHODIST HOSPITAL, WUHU, CHINA	295, 333
AMERICAN METHODIST WOMEN'S HOSPITAL, KIUKIANG, CHINA	295, 335
AMERICAN PRESBYTERIAN HOSPITAL, CHANGTEH, HUNAN, CHINA	335-336
AMERICAN PRESBYTERIAN HOSPITAL, CHEFOO, CHINA	325-326
AMERICAN PRESBYTERIAN HOSPITAL, HWAIYUAN, CHINA ...	332-333
AMERICAN PRESBYTERIAN HOSPITAL, KACHEK, HAINAN, CHINA	337
AMERICAN PRESBYTERIAN MISSION, MEN'S HOSPITAL, PAOTING- FU, CHINA	324
AMERICAN PRESBYTERIAN MISSION, MEN'S HOSPITAL, SHUN- TEHFU, CHINA	325
AMERICAN RED CROSS:	
Nursing survey	123
Appropriation for tuberculosis work in France	241
Also	30, 46

	PAGE
AMERICAN RELIEF ADMINISTRATION.....	46
AMERICAN SOCIETY OF SOCIAL HYGIENE.....	123
AMOY, <i>see</i> REFORMED CHURCH IN AMERICA (DUTCH) HOSPITAL, AMOY, CHINA.	
ANCYLOSTOMA, VIABILITY, <i>see</i> HOOKWORM LARVAE, VIABILITY	
<i>Ancylostoma duodenale</i>	138, 164
ANCYLOSTOMES.....	159
ANEMIA.....	137, 140
ANKING, <i>see</i> AMERICAN EPISCOPAL HOSPITAL, ANKING, CHINA.	
ANKYLOSTOMIASIS, <i>see</i> HOOKWORM DISEASE; UNCINARIASIS	
COMMISSION TO THE ORIENT.	
<i>Anopheles</i> (MOSQUITO).....	20, 21, 23
ANTI-MOSQUITO MEASURES, <i>see</i> MALARIA CONTROL.	
APOPA, SALVADOR.....	183
AQUIARES ESTATE, COSTA RICA.....	183
ARIZONA.....	137
ARKANSAS:	
Anti-mosquito measures for malaria control.....	72, 218, 220
Relief and control of hookworm disease.....	98, 188
Also.....	7, 20, 21, 22, 24, 68
<i>See also</i> Names of towns.	
ARKANSAS STATE DEPARTMENT OF HEALTH.....	218
ARMITAGE, J. AURIOL.....	266
ARMY MEDICAL COLLEGE, PEKING.....	316
<i>Ascaris</i> (INTESTINAL PARASITE).....	188, 189
ASHFORD, DR. B. K.....	178
ASSAM:	
Hookworm infection in tea gardens.....	126
ATIBAIA, BRAZIL.....	164
AURORA UNIVERSITY, SHANGHAI.....	317
AUSTRALIA:	
Plans for enlarged program for hookworm control.....	106-107
Hookworm infection among aborigines.....	128-129
Also.....	26, 67, 71, 73
<i>See also</i> Queensland.	
BAGACES, COSTA RICA.....	183
BAHIA (STATE) BRAZIL:	
Hookworm infection survey.....	99, 176
Progress of soil sanitation.....	214
Recurrence of yellow fever.....	234
BAILEY, DR. C. A.....	68, 233
BALLARD, JAMES F.....	273

	PAGE
BALME, DR. HAROLD.....	342
BAPTIST MISSIONARY SOCIETY OF ENGLAND.....	311
BARBER, DR. M. A.:	
Development of glycerine-salt method of hookworm diagnosis	152
Development of brine flotation-loop method of hookworm diagnosis.....	154
On treatment of hookworm disease with oil of chenopo- dium.....	162, 167
Experiments with beta-naphthol in treatment of hookworm disease.....	171
BARNES, DR. M. E.....	68
BARTON, JAMES L.....	266
BASS, DR. C. C.....	68, 11
BATAVIA:	
Hemoglobin index among prisoners.....	137
BAUXITE, ARKANSAS:	
Malaria control measures.....	220
BAXTER, DR. DONALD E.....	267, 272, 285
BAYMA, DR. THEODORO.....	171, 172
BEATY, MARY L.....	285
BEAMAN, NORVIL.....	318
BELGIUM:	
Reduction of hookworm disease in mines.....	182
BELLE VUE DISTRICT, BRITISH GUIANA.....	144
BENGAL:	
Hookworm infection in jails.....	126
BENNETT, B. FRANK.....	272
BETA-NAPHTHOL:	
In treatment of hookworm disease.....	159, 171-172
BIGGS, DR. HERMANN M.....	56, 66
BINET-SIMON TEST:	
On school children in Queensland.....	147
BIRTH RATE:	
Affected by hookworm disease.....	145
<i>See also</i> Pregnancy.	
BISMARCK ARCHIPELAGO.....	107
BLACK, DR. DAVIDSON.....	274, 279, 306
BLISSVILLE, ARKANSAS:	
Malaria control measures.....	220
BOGAWANTALAWA AREA, CEYLON.....	185, 186
BOGOTÁ, COLOMBIA.....	128
BOLIVAR COUNTY, MISSISSIPPI:	
Malaria control measures by treatment of carriers.....	223-224

	PAGE
Quinine in malaria control	226-227
BORING, ALICE M.	291
BORNEO:	
Hookworm infection survey authorized	176
BOYS, <i>see</i> CHILDREN.	
BRAAFLADT, DR. L. H.	311
BRANCH, DR. J. R. BROMWELL	314
BRAZIL:	
Organization of rural sanitary service	80, 83
Recurrence of yellow fever and operations for control	
.....	90, 93, 229, 234
Government appropriations for public health	107-108
Public health training	108, 110
Hookworm infection	127, 133, 135
Comparative hookworm infection among agriculturists and	
townspeople	136
Comparative results in methods of diagnosis of hookworm	
infection	152
Establishment of average efficiency of dosage of oil of chen-	
opodium	163, 164
Experiments with purges in treatment for hookworm disease	
.....	167-168
Modified intensive plan for hookworm control	193
Government regulations regarding latrines	206
Also	7, 8, 11, 26, 45, 67
<i>See also</i> Names of cities and states.	
BRINE FLOTATION—LOOP METHOD, <i>see</i> HOOKWORM DISEASE,	
DIAGNOSIS.	
BRITISH GUIANA:	
Campaign for control of hookworm disease	83-84, 98
Organization of sanitary department and plans for work ...	84-85
Hookworm re-infection surveys	101-102
Effect of sanitary reform on hospital in Georgetown	144
Investigations on viability of hookworm larvae	188
Co-operation of Planters' Association toward hookworm	
control	196
Also	67, 71, 162
BRITLAND, A. J. D.	286
BROWN, ANNIE.	285
BROWN, ARTHUR J.	266
BROWN, FLORENCE	285
BROWN, N. WORTH	297
BRUNO, DR. ALEXANDRE	68

	PAGE
BRYCE-DELANEY, W. H.	68
BURRES, DR. W. T.	67
BUTTRICK, DR. WALLACE.	x, xi, 55, 56, 57, 66, 266
CAGE, DR. HELEN.	314
CALCUTTA:	
Hookworm infection in jail.	126
CALDWELL, DR. F. C.	69, 155-156
CALIFORNIA:	
Investigation on viability of hookworm larvae.	187
CAMP BOWIE, TEXAS:	
Hookworm infection among soldiers.	143
CAMP JACKSON, SOUTH CAROLINA:	
Hookworm infection among soldiers.	136-137
CAMP TRAVIS, TEXAS:	
Lowered mentality in soldiers caused by hookworm disease. .	146
CAMPECHE, MEXICO.	235
CANADA, MEDICAL SCHOOLS IN:	
Appropriation by Rockefeller Foundation.	44
CANADIAN PRESBYTERIAN MISSION.	311
CANAL ZONE:	
Outbreak of yellow fever.	229
Also.	8
CANTON, CHINA.	303
<i>See also</i> Kwangtung Kung Yee Medical College, Canton.	
CANTON CHRISTIAN COLLEGE, CHINA.	318
CANTON HOSPITAL, CHINA.	336
CANTON MEDICAL MISSIONARY UNION.	316, 336
CARONÍ AREA, TRINIDAD.	199
CASTOR OIL.	171
CAULFIELD, KATHLEEN.	285
CEARA, BRAZIL.	234
CENTRAL AMERICA:	
Yellow fever reported.	90
Rates of hookworm infection.	128
Pre-campaign sanitation.	206
Also.	7, 20, 21, 71
<i>See also</i> Names of countries.	
CENTRAL MAHE AREA, SEYCHELLES ISLANDS.	195
CENTRIFUGE METHOD, <i>see</i> HOOKWORM DISEASE, DIAGNOSIS.	
CEYLON:	
Relief and control of hookworm disease.	98

	PAGE
Necessity of sanitation.....	100
Hookworm re-infection surveys.....	101-102
Compliance with sanitary regulations.....	103-104
Rate of hookworm infection.....	125
Effect of altitude on hookworm infection.....	130
Effect of hookworm disease on influenza.....	143
Fewer sickness calls and hospital admissions as result of treatment of hookworm disease.....	144
Dosage of oil of chenopodium for children and adults in treatment of hookworm disease.....	163
Diet and oil of chenopodium in treatment of hookworm disease	166-167
Chenopodium-Croton oil in treatment of hookworm dis- ease.....	169-170
Experiments on undivided doses of oil of chenopodium in treatment of hookworm disease.....	170
Rates of re-infection.....	185-186
Modified intensive plan for hookworm control.....	190, 193
Post-campaign measures.....	194
Government regulations regarding latrines.....	206
Estate and village sanitation.....	210, 213
Interest of the Singhalese in latrines.....	213-214
Also.....	7, 25, 67, 149, 150, 156, 168
CHANGLI, CHINA.....	322
CHANGSHA, CHINA.....	7, 303
CHANGTEH, HUNAN, <i>see</i> AMERICAN PRESBYTERIAN HOSPITAL, CHANGTEH, HUNAN, CHINA.	
CHAR, DR. GEORGE Y.....	284, 300
CHARTRES TOWERS, AUSTRALIA.....	130
CHEER, SHEO-NAN.....	301
CHEFOO, <i>see</i> AMERICAN PRESBYTERIAN HOSPITAL, CHEFOO, CHINA.	
CHEMICAL LATRINE, <i>see</i> LATRINES.	
CH'ENG, T. Y.....	311
CHENGCHOW, <i>see</i> SOUTHERN BAPTIST HOSPITAL, CHENGCHOW, CHINA.	
CHENOPODIUM, <i>see</i> OIL OF CHENOPODIUM.	
CHENOPODIUM-CROTON OIL:	
In treatment of hookworm disease.....	169-170
CHIANG, JU-CHI.....	286
CHIAPAS, MEXICO.....	235
Chicago, U. S. S.....	233

	PAGE
CHIENGMAL, SIAM:	
Rate of hookworm infection	128
Average hemoglobin index	140
CHILDREN:	
Hookworm infection on coffee plantations	136
Hookworm infection among vagabond boys in Brazil	136, 164
Hemoglobin rates among hookworm infected boys at São Paulo	137
Effects of sanitary reform on orphanage and boys' reformatory, Trinidad	144
Effect of hookworm disease in mental development	145-147
Routine dosage of thymol	161
Dosage of oil of chenopodium and standard method of administering	162-163
Re-infection at San Salvador and Costa Rica	183
Infection among boys at Onderneeming Industrial School, British Guiana	188
Dosage of quinine in malaria control	226
CHILE	116
CHINA:	
Modern influences on practice and teaching of medicine	36-38
Experiments on undivided doses of oil of chenopodium in treatment of hookworm disease	170-171
Investigations on viability of hookworm larvae	187-188
Government regulations regarding latrines	206
Also	7, 8, 25, 67, 336
See also Pinghsiang Colliery, China; Names of places and of missionary institutions.	
CHINA CHRISTIAN EDUCATIONAL ASSOCIATION	342
CHINA CONTINUATION COMMITTEE	342
CHINA MEDICAL BOARD:	
Purposes	38-39
Appropriations for pre-medical training, hospitals, and fellowships	42-43
Officers and members	57
Résumé of medical education in China	259-264
Plans for co-operation with existing agencies ..	260-263, 341, 343
Peking Union Medical College	263, 305-308
Appropriation for North China Language School	277
Assistance to missionary schools	287-288
Aid to pre-medical schools	291-293
Appropriations for mission hospitals	293-295, 335-339
Losses in rates of exchange	294

	PAGE
Fellowships and scholarships, with names of holders	
.....	295-302, 339-341
Contribution to publication committee.....	302
Stated meetings and meetings of committees.....	302-303
Shanghai Medical School.....	308
St. John's University Medical School.....	309
Harvard Medical School of China.....	309
Red Cross General Hospital.....	309-310
Shantung Christian University Medical School.....	310-313
Hunan-Yale Medical College.....	313-315
Medical schools for women.....	316
Other medical schools.....	316-319
General conditions among hospitals.....	319-321
Aid to hospitals in Peking and Shanghai districts.....	321-337
Results of aid to hospitals.....	337-339
CHINA MEDICAL MISSIONARY ASSOCIATION 38, 260, 302, 311, 341-343	
CHINESE NATIONAL MEDICAL ASSOCIATION.....	38, 260
CHINESE RED CROSS SOCIETY.....	309, 335
CHLOROFORM:	
In treatment of hookworm disease.....	159, 170
CHOLUTECA, HONDURAS.....	233
CHRISTIAN MISSION HOSPITAL, LUCHOWFU (HOFEIHSEN)	
CHINA.....	334
CHRISTIAN MISSION HOSPITAL, NANTUNGCHOW, CHINA....	329-330
CHRISTIENSEN, A.....	327
CHRISTIE, DR. DUGALD.....	315
CHU, DR. HUNG-PIH.....	300, 314
CHU, LEE-CHONG.....	286
CHUAN, SHAO-JEN.....	285
CHURCH MISSIONARY SOCIETY.....	331
CHURCH OF THE BRETHREN MISSION, SHANSI, CHINA.....	327
CHURCH OF ENGLAND MISSION.....	311
CHURCH OF SCOTLAND MISSION HOSPITAL, ICHANG, CHINA....	336
CLIMATE:	
Effect on hookworm infection.....	130
COCHRAN, DR. SAMUEL.....	333
COFFEE PLANTATIONS:	
Hookworm infection among laborers.....	136
Treatment of laborers for hookworm disease.....	165
COLOMBIA:	
Hookworm infection survey begun.....	99, 176
Rate of hookworm infection.....	128
Effect of altitude on hookworm infection.....	130

	PAGE
Occupations and hookworm infection	133
Also	73, 133
COMITÉ NATIONAL	97
COMMISSION FOR PREVENTION OF TUBERCULOSIS IN FRANCE:	
Aims and development of work	28-29, 93-94, 97
Nurses' training schools and courses for physicians	29
Construction of sanitariums	30-31, 97-98
Development of community spirit	31-32
Punch and Judy shows and other publicity work	32-34
Field staff	68
Work of the medical division	236, 239
Department of nursing	239
Departments of Education and Extension	239-241
Amount expended	251, 252
Summary of work accomplished	241
Also	7, 73, 112
CONCRETE VAULT LATRINE, <i>see</i> LATRINES.	
CONNER, DR. M. E.	68
<i>Control of Hookworm Disease by the Intensive Method</i> , by Dr.	
H. H. Howard	116, 117
COOLIDGE AND SHATTUCK, BOSTON (ARCHITECTS)	272
COSTA RICA:	
Re-infection surveys	101-102
Government appropriation for hookworm control	105
Effect of treatment on hemoglobin index	140
Rate of re-infection	183-184
Government regulations regarding latrines	206
Government enforcement of sanitary regulations	209-210
Also	67, 98
COUNTY HEALTH DEPARTMENTS:	
Range of activities	75, 76, 79
Comparative state appropriations	80
<i>See also</i> North Carolina.	
COUNTY HEALTH OFFICER	74
COUNTY HEALTH SURVEY	76
COVINGTON, DR. P. W.	67
COWDRY, DR. EDMUND V.	267, 274, 278; 306
COX, DR. JAMES R.	297
CRAWFORD, DR. A. S.	314
CROSSETT, ARKANSAS:	
Malaria control measures	218
CROWELL, F. ELIZABETH	68
CRUZ, DR. OSWALDO	10

	PAGE
CZECHO-SLOVAKIA.....	8, 45
DARJEELING DISTRICT, INDIA.....	145
DARLING, DR. S. T.:	
Standard method of administering oil of chenopodium	
.....	162-163, 167
Experiments with beta-naphthol in treatment of hookworm	
disease.....	171
Also.....	69, 110
DARLINGTON COUNTY, SOUTH CAROLINA.....	216
DAVITT, DR. G. G.....	314
DEDWYLDER, DR. R. D.....	68
DEMERARA BAUXITE COMPANY, BRITISH GUIANA.....	196
DERMOTT, ARKANSAS:	
Malaria control measures.....	220
DERSHIMER, DR. F. W.....	67, 188
DICKOYA AREA, CEYLON.....	185
DILLEY, DR. FREDERICK E.....	283
DINKELACKER, BERTHA F.....	311
DINKELACKER, EFFIE I.....	311
DISPENSARIES:	
For tuberculosis work in France	
.....	29, 30, 31, 94, 97, 98, 236-241
Study of conditions in New York City.....	47
DIVISION OF MEDICAL EDUCATION, <i>see</i> ROCKEFELLER FOUNDA-	
TION—DIVISION OF MEDICAL EDUCATION.	
DOCK, DR. GEORGE.....	161
DOOLITTLE, J. W.....	318
DUNLAP, DR. ALBERT M.....	267, 278, 307
DUST, <i>see</i> HOOKWORM LARVAE, VIABILITY.	
DUTCH GUIANA:	
Average hemoglobin index.....	140
Also.....	25
DYSENTERY:	
Treatment with oil of chenopodium.....	171
EARTH PIT LATRINE, <i>see</i> LATRINES.	
ECUADOR.....	7, 68
<i>See also</i> Guayaquil.	
EGGLESTON, MARGERY K.....	57
ELLIS, DR. STANLEY.....	312
ELPITIYA AREA, CEYLON.....	186
EMBREE, EDWIN R.....	x, xi, 55, 56, 57, 66, 266

	PAGE
EMBREY, HARTLEY C.	280
ENGLISH BAPTIST HOSPITAL, TAIYUANFU, CHINA.	326-327
ENGLISH BAPTIST MISSION.	312
ENGLISH PRESBYTERIAN MISSION.	311
ENGLISH WESLEYAN MISSIONARY SOCIETY.	311
ESPIRITO SANTO (STATE) BRAZIL	
Hookworm infection survey.	99
EUCALYPTUS	
In treatment of hookworm disease.	159
EUDORA, ARKANSAS:	
Malaria control measures.	220
EURE-ET-LOIR, FRANCE.	29, 31, 97, 236
EVANS, DR. P. S., JR.	311, 312
FACULTY OF MEDICINE AND SURGERY, <i>see</i> UNIVERSITY OF SÃO PAULO, BRAZIL—LABORATORY OF HYGIENE.	
FAIRFAX COUNTY, VIRGINIA.	216
FAUST, ERNEST C.	280
FECES, <i>see</i> HOOKWORM LARVAE, VIABILITY.	
FECES, EXAMINATION OF, <i>see</i> HOOKWORM DISEASE, DIAGNOSIS.	
FEDERAL DISTRICT, BRAZIL:	
Rate of hookworm infection.	127
Also.	98, 108
FEDERATED MALAY STATES:	
Results of investigations on comparative methods of examination for hookworm disease.	151-152
FELLOWSHIPS AND SCHOLARSHIPS:	
By China Medical Board.	43, 295-302, 339-341
In public health work.	74, 111-112
Also.	8, 45
FENCHOW, <i>see</i> AMERICAN BOARD MISSION, FENCHOW, SHANSI.	
FENG, C. T.	291
FERRELL, DR. JOHN A.	56, 67
FIJI ISLANDS:	
Hemoglobin index among East Indians.	137-138
Results of examinations on comparative methods of examination for hookworm disease.	151-152
Also.	196
FINLAY, DR. CARLOS.	9
FLEXNER, DR. SIMON.	x, xi, 55, 56, 57, 66, 266
FLIES, <i>see</i> HOOKWORM LARVAE, VIABILITY.	
FLORIDA.	137

	PAGE
FOOCHOW, <i>see</i> FUKIEN CHRISTIAN UNIVERSITY, FOOCHOW, CHINA.	

FORMOSA:

Rates of hookworm infection at Taikoku jail	128
Hookworm infection index	135
FORT OGLETHORPE, GEORGIA	172
FOSDICK, HARRY E.	x, xi, 55
FOSTER, DR. J. H.	314
FUKIEN CHRISTIAN UNIVERSITY, FOOCHOW.	42, 292, 315, 317-318

<i>Gambusia affinis</i>	223
GARDNER, DR. P. B.	67
GATES, FREDERICK T.	x, xi, 55, 56, 57, 66
GAUNT, DR. F. P.	297
GENERAL (STATE) COSTA RICA.	128
GEORGETOWN, BRITISH GUIANA.	84, 144

GEORGIA:

Relief and control of hookworm disease	98
Lack of latrines in Hart county	199
Anti-mosquito measures for malaria control	220
Also.	68

GERMANY:

Reduction of hookworm disease in mines.	182
GIBSON COUNTY, TENNESSEE	216
GILFILLAN, EMILY	286
GINGLING COLLEGE, NANKING, CHINA.	292-293, 319
GLYCERINE-SALT METHOD, <i>see</i> HOOKWORM DISEASE, DIAGNOSIS.	
GODDARD'S REVISION, <i>see</i> BINET-SIMON TEST.	
GONZAGA, DR. OCTAVIO.	172
GOODMAN, FLORENCE.	285
GOODNOW, FRANK J.	57
GORGAS, SUR.-GEN. W. C.:	

Control of yellow fever and malaria	10-11
Head of Yellow fever commission to Central America	18-19
Head of Yellow fever commission to west coast of Africa	93
Also.	17, 56, 66, 68

GORMAN, A. E.	68
GOVERNOR'S ISLAND, BRAZIL	214
GRANT, DR. J. B.	67
GREEN, H. W.	68
GREENE, ROGER S.:	

<i>China Medical Board: a Review of Its Work from 1915 to 1919</i>	305-343
---	---------

	PAGE
Also	57, 267, 303
GREGG, ALAN	67
GUARULHOS, BRAZIL:	
Percentage of cures among high rates of hookworm infection ..	134
Hookworm infection among farm workers	136
GUATEMALA:	
Outbreak of yellow fever and its control	18
Relief and control of hookworm disease	98
Government appropriations for hookworm control	104-105
Rate of hookworm infection	128
Outbreak and control of yellow fever in 1918, incidence, and death rate	229-230
Government efforts toward control of yellow fever	230-234
Also	19, 67, 68, 168
GUAYABAL, SALVADOR	233
GUAYAQUIL:	
Endemic center of yellow fever	10
Work of the yellow fever commission	11-14
Campaign for eradication of yellow fever and its results	14-17, 73, 88-90, 228
Also	8, 18
<i>Guignol, Le, see PUNCH AND JUDY SHOWS.</i>	
GUINDA, MINAS GERAES	129
GUITERAS, DR. JUAN	178
GUNN, DR. SELSKAR M.	68
HACKER, DR. H. P.:	
Standard method of administering chenopodium	162-163, 167
Experiments with beta-naphthol in treatment of hookworm disease	171
HACKETT, DR. L. W.:	
Experiments with beta-naphthol in treatment of hookworm disease	171
Also	67
HACKETT MEDICAL COLLEGE FOR WOMEN, CANTON	315, 316
HADDEN, DR. G.	314
HAGMAN, DR. G. L.	298
HAITI, WEST INDIES	8
HALIFAX, NOVA SCOTIA:	
Survey of health conditions	47, 122
HALL, FRANCES S.	285
HALL, DR. M. C.	161

	PAGE
HAMBURG, ARKANSAS:	
Malaria Control Measures	220
HAMILTON, H. C.	161
HAMILTON, J. H.	69
HAN, CHUNG-HSIN.	286
HANGCHOW, CHINA.	311
HANKOW, CHINA.	37, 303, 311
HARMON, F. H. B.	311
HARRISON COUNTY, MISSISSIPPI.	215
HART COUNTY, <i>see</i> GEORGIA.	
HARVARD MEDICAL SCHOOL OF CHINA.	309
HAUSHEER, DR. W. C.	69
HAWKINS, F. H.	266
HEISER, DR. V. G.	56, 67, 122
HEMOGLOBIN:	
Rates among boys, soldiers, and prisoners.	137-138
Attempts to determine relative rates associated with hook-	
worm infection.	137-138
Results of treatment of hookworm disease.	140
Average in cases of hookworm infection in Paraná.	177
Average in Minas Geraes.	178
Average in Porto Rico.	179
Also.	193
HENRY STURGIS GREW MEMORIAL FUND.	309
HEPBURN, A. BARTON.	x, xi, 55
HILL, R. B.	68
HINDS COUNTY, MISSISSIPPI:	
Anti-malaria experiments.	22
Anti-mosquito measures for malaria control and per capita	
cost.	220-226
Use of top-feeding minnow.	223
HUANG BORIRACKSHA:	
Treatment of Siamese soldiers for hookworm disease.	143
HODGES, DR. PAUL C.	283
HONDURAS:	
Outbreak of yellow fever.	73, 90, 229
Government efforts toward control of yellow fever.	230-234
Also.	7, 18, 19
HONGKONG UNIVERSITY SCHOOL OF MEDICINE.	37, 260, 316
HOOGHLY, INDIA:	
Hookworm infection in jail.	126
HOOKWORM DISEASE:	
Geographic distribution.	25

	PAGE
Preparation of bibliography and production of film	28, 121-122
HOOKWORM DISEASE, DIAGNOSIS:	
Methods	148
Use of vermifuge and microscope	148, 149
Manner of submitting fecal specimens	148, 149
Plain smear method	149
Centrifuge method and preparation of slides	149
Method of preparing stools for centrifugation	150
Levitation method of preparing slides	150-151
Comparative results and accuracy of methods	151-152, 153-154
Test cases in Brazil	152
Glycerine-salt method	152-153
Brine flotation-loop method and Caldwell modification	154-156
Winsor variation of brine flotation-loop method	156-157
Difficulty of exact diagnosis	157
Vermicidal diagnosis	157-158
Method of washing stools	158
HOOKWORM DISEASE, INFECTION:	
Rates in various countries	125-129
Effect of rainfall and of salt	129-130
Relation to altitude and climate	130
Effect of rural conditions	130, 133
Rates affected by occupation	133
Lessened by wearing shoes	133
Method and value of worm counts	135
Among troops in United States army	136-137
Cumulative effects	139
Increase in body weight after treatment	143
Effect on birth rate	145
Effect on mental development	145-147
Fly transmission	188-189
Rate of reduction following control measures	215
HOOKWORM DISEASE, INFECTION SURVEYS:	
Conducted or authorized during 1919	73-74, 98-99, 176
Based on worm counts	179, 181
<i>See also</i> Names of places.	
HOOKWORM DISEASE, RE-INFECTION:	
Rates in Salvador, Costa Rica, Trinidad, Nicaragua, Sey- chelles, and Ceylon	183-186
Contributing factors	186-187
Effect of dry season	206
HOOKWORM DISEASE, RELIEF AND CONTROL:	
Results of campaigns	26-27

	PAGE
Field staff.....	67-68
Campaigns organized.....	71
Campaign in British Guiana.....	83-84
Fields of operation.....	98
Infection surveys.....	98-100
Outstanding features.....	100
Failure of measures in Ceylon and Porto Rico.....	100-101
Re-infection surveys.....	101-102
Government grants.....	104-107
Increased financial support in Brazil.....	107-108
Amount expended.....	251-253, 367-370
Work among southern troops of United States army.....	136-137
Campaigns followed by lower general morbidity rates.....	143-145
Nearest approaches to complete eradication.....	182
Means and method of extending treatment.....	189-190
Important factors.....	190
Modified intensive plan.....	190, 193
Relative efficiency of various methods.....	193
Post-campaign measures in Ceylon.....	194
Re-campaign measures in Seychelles Islands.....	195
Student and army forces as propagandists.....	195-196
Co-operation of business organizations.....	196
Tabular summary.....	243-248
HOOKWORM DISEASE, TREATMENT:	
Principal remedies.....	159
Routine dosage of thymol.....	161-162
Standard method of administering oil of chenopodium and dosage.....	162-163
Diet.....	166-167
Importance of purgatives.....	167-169
Administration of Chenopodium-Croton Oil.....	169-170
Experiments with beta-naphthol.....	171-172
Intra-intestinal tube method.....	172-174
HOOKWORM LARVAE, VIABILITY:	
In soil and feces.....	187
Investigations in California and China.....	187
In water and without oxygen.....	188
Investigations in storage pits, sand, flies, and dust.....	188-189
HÔPITAL DOUMER, CANTON.....	317
HOPKINS, DR. N. S.....	321
HOSPITALS, <i>see</i> CHINA MEDICAL BOARD; Names of Hospitals.	
HOUGHTON, DR. HENRY S.....	267, 272, 278, 305
HOW, G. K.....	314

	PAGE
HOWARD, DR. HARVEY J.....	267, 275, 279, 307
HOWARD, DR. HECTOR H.:	
<i>The Control of Hookworm Disease by the Intensive Method</i>	116, 117
Routine dosage of thymol.....	161
Investigations on malaria control in rural regions.....	220
Also.....	56, 67, 68
HRDLÍČKA, DR. ALEŠ.....	341
HSIEH, EN-TSENG.....	280
HSIN K'AI LU, PEKING.....	308
HU, CHEN-HSIANG.....	301
HU, YING-TEH.....	286
HUCHOW UNION HOSPITAL, CHINA.....	332
HUGHES, CHARLES E.....	x, xi, 55
HULL, MAYNARD V.....	286
HUME, DR. E. H.....	314
HUMPHREYS, DR. J. CHARLES.....	298
HUNAN-YALE MEDICAL COLLEGE, CHANGSHA:	
Grants, organization, faculty, and students.....	313-315
Hospital and pre-medical school.....	314-315
Future prospects.....	315
Also.....	42, 287, 340
HUSSEY, HARRY.....	268
HWAIYUAN, <i>see</i> AMERICAN PRESBYTERIAN HOSPITAL, HWAIYUAN, CHINA.	
HWANGHIEN, <i>see</i> SOUTHERN BAPTIST HOSPITAL, HWANGHIEN, CHINA.	
HYDRICK, DR. J. L.....	67
ICHANG, <i>see</i> CHURCH OF SCOTLAND MISSION HOSPITAL, ICHANG, CHINA.	
INCINERATION PLANTS, <i>see</i> SEWAGE DISPOSAL.	
INDIA:	
Source of hookworm infection.....	125
Also.....	20-21
INDIAN MEDICAL SERVICE.....	125
INDIAN RESEARCH FUND ASSOCIATION.....	126
INFLUENZA:	
Death rate in Ceylon affected by hookworm disease.....	143
Also.....	35
INGRAM, RUTH.....	285
INTERNATIONAL HEALTH BOARD:	
Basis of work.....	23-24
Officers and members.....	56

	PAGE
Administrative and field staffs	67-69
Activities	71-75
Field studies in malaria control	86-88
Measures against yellow fever	88-93
Commission for Prevention of Tuberculosis in France	93-98
Work in control of hookworm disease	98-101
Appropriation for hookworm control in Siam	106
Fellowships for public health work	111, 112
Study leave for staff members	112-113
Organization of division of laboratory service	113-114
Studies on public health administration	115-116
Reports and publications issued	116-121
Bibliography of hookworm disease	121-122
Film on hookworm disease and malaria	122
Survey of health conditions at Halifax, Nova Scotia	122
Railway sanitary code	123
Survey of health conditions at Olean, New York	123
Social hygiene survey	123
Nursing survey	123
Financial statement, with tables showing expenditures	251-253
Summary of work accomplished	241
INTERNATIONAL HEALTH BOARD—DEPARTMENT OF SURVEYS AND	
EXHIBITS:	
Public health work	116
INTRA-INTESTINAL TUBE METHOD, <i>see</i> HOOKWORM DISEASE,	
TREATMENT.	
JACAREPAGUA, FEDERAL DISTRICT, BRAZIL:	
Rate of hookworm infection	127
JACKSON COUNTY, MISSISSIPPI	215
JACOBS, DR. W. P.	67
JAILS, HOOKWORM DISEASE IN	126, 128, 137
JAMAICA:	
Campaign for relief and control of hookworm disease	73, 99
Rate of hookworm infection	128
Effect of salt on hookworm infection	129-130
Pre-campaign sanitation	209
Also	67, 162
JAPAN:	
Influence upon medicine in China	36-37
JAUNDICE, INFECTIOUS	11, 12
JAVA:	
Comparative hookworm infection among agriculturists and townspeople	136

	PAGE
Also.....	135
JEWISH JOINT DISTRIBUTION COMMITTEE.....	46
JOHNS HOPKINS UNIVERSITY—SCHOOL OF HYGIENE AND PUBLIC HEALTH.....	8, 34-36, 113
JOHNSON, E. B.....	68
JOHNSTON, DR. E. M.....	298
JORDAN, EDWIN O.....	56
JUDSON, HARRY P.....	x, xi, 55, 57
KACHEK, HAINAN, <i>see</i> AMERICAN PRESBYTERIAN HOSPITAL, KACHEK, HAINAN, CHINA.	
KANTOR, DR. J. L.....	172, note, 173
KAO, SHIH-EN.....	286
KAO, YU-HWA.....	285
KASHING, <i>see</i> SOUTHERN PRESBYTERIAN HOSPITAL, KASHING, CHINA.	
KAU, DR. EDWARD Y.....	300
KELLOGG, C. F.....	318
KELLY, DR. C. B.....	298
KENDALL, DR. A. I.....	12
KENDALL, ROBERT R.....	272
KENDRICK, DR. J. F.....	68
KENTUCKY:	
State aid for county health work.....	80
Relief and control of hookworm disease.....	98
Field investigations on latrines.....	200, 203
Also.....	67
KIANG, DR. PETER.....	312
KILGORE, DR. A. R.....	298
KING, TZE.....	301
KING, DR. W. W.....	178
KIRK, ROBERT H.....	x, xi, 56, 266
KIUKIANG, <i>see</i> AMERICAN METHODIST WOMEN'S HOSPITAL, KIUKIANG, CHINA.	
KLIGLER, DR. I. J.....	68, 200, 203
KNOWLTON, DR. R.:	
Treatment of United States troops for hookworm infec- tion.....	136-137
Method of computing efficiency of vermicides.....	174-175
KOFOID, DR. C. A.:	
Report on effect of hookworm infection at Camp Bowie.....	143
Results of investigations on hookworm disease and lowered mentality.....	146

	PAGE
Development of brine flotation-loop method of hookworm diagnosis.....	154
Investigations on viability of hookworm larvae.....	187
KORNS, DR. JOHN H.....	267, 275, 280
KOSLANDA-HAPUTALE AREA, CEYLON.....	186
K'UNG, HSIEN-WA.....	286
KUNG YEE MEDICAL COLLEGE, <i>see</i> KWANGTUNG KUNG YEE MEDICAL COLLEGE.	
KWANGTUNG KUNG YEE MEDICAL COLLEGE, CANTON.....	315, 337
KWOH, F. E. P.....	311
LA DIGUE, SEYCHELLES ISLANDS.....	214
LA UNIÓN, SALVADOR.....	233
LABORATORY OF HYGIENE, <i>see</i> UNIVERSITY OF SÃO PAULO, BRAZIL—LABORATORY OF HYGIENE.	
LAICHOWFU, <i>see</i> SOUTHERN BAPTIST HOSPITAL, LAICHOWFU, CHINA.	
LAKE VILLAGE, ARKANSAS:	
Malaria control measures.....	220
LAMBERT, DR. S. M.....	67
LAMPONG DISTRICT, SUMATRA.....	128
LANE, CHARLES E.....	272
LANE, LIEUT.-COL. CLAYTON:	
Investigations on hookworm disease in tea gardens and jails.....	126, 145
Levitation method of preparing slides for diagnosis of hookworm disease.....	150-151
LATRINES:	
Installation in advance of treatment campaigns.....	100-101, 102
In the West Indies and Central America.....	103, 209-210
On estates in Ceylon.....	103, 104
Statistics on accommodations in tropics and sub-tropics.....	198-199
Study of types and recommendations.....	200-206
Government regulations.....	206-209
Lessening typhoid fever.....	216, 217
Also.....	177, 178, 179, 182, 183-184, 185, 188, 193
LAVENTILLE AREA, TRINIDAD.....	199
LAZEAR, DR. J. W.....	9
LEAGUE OF NATIONAL RED CROSS SOCIETIES.....	46
LEAVELL, DR. GEORGE W.....	298
LEE COUNTY, MISSISSIPPI:	
Development of health program.....	27
LENNOX, DR. WILLIAM G.....	280

	PAGE
LEÓN, NICARAGUA.....	233
<i>Leptospira icteroides</i>	13, 90
LEVITATION METHOD, <i>see</i> HOOKWORM DISEASE, DIAGNOSIS.	
LEWIS, DR. CHARLES.....	324
LI, DR. T. L.....	314
LI, DR. TSING-MEU.....	283
LI, WEN-SHANG.....	285
LIAOCHOW, <i>see</i> CHURCH OF THE BRETHREN MISSION, SHANSI, CHINA.	
LIBERIA, COSTA RICA.....	184
LIEA, DR. T. C.....	314
LICEAGA, DR. EDUARDO.....	10
LIÉGE, <i>see</i> BELGIUM.	
LIM, DR. CHONG-EANG.....	300
LIMA, DR. AZEVEDO.....	172
LINCÖLN, DR. C. S. F.....	298
LING, WEN-PING.....	301
LIU, DR. C. C.....	300
LIU, JU-KANG.....	286
LIU, DR. JUI-HENG.....	283
LIU, DR. JUI-HUA.....	284, 300
LOGAN, DR. O. T.....	298, 336
LOH, VEN-TSAO.....	301
LONDON MISSION HOSPITAL, SIAOCHANG, CHINA.....	327
LONDON MISSION HOSPITAL, TSANGCHOW, CHINA.....	327-328
LONDON MISSIONARY SOCIETY.....	305, 312, 319
LONDON SCHOOL OF TROPICAL MEDICINE.....	113
LOOSS, DR. ARTHUR.....	188
LOUISIANA:	
Relief and control of hookworm disease.....	98
Anti-mosquito measures for malaria control.....	220
LOVE, DR. O. H.....	298, 323
LUCHOWFU, <i>see</i> CHRISTIAN MISSION HOSPITAL, LUCHOWFU (HOFEIHSEN) CHINA.	
LYSTER, GEN. T. C.....	68, 233
MA, K. M.....	280, 291
MCALL, DR. P. L.....	298
MCCOY, MARY.....	285
MCCRACKEN, DR. J. C.....	328
MCCULLOUGH, E. GRACE.....	286
MCGEHEE, ARKANSAS:	
Malaria control measures.....	220

	PAGE
McLEAN, DR. FRANKLIN C.....	278, 303, 305
McOWAN, B. M.....	311
MADRAS (PRESIDENCY):	
Hookworm infection survey authorized.....	176
MAGNESIUM SULPHATE.....	167, 168, 173
MAGOON, E. H.....	68
MAIN, DR. D. DUNCAN.....	311
MALARIA:	
Geographic distribution.....	20-21
Lecture Chart, production of film.....	122
Also.....	83, 137, 140, 172
MALARIA CONTROL:	
Scientific basis.....	21
Per capita cost.....	21-23
Treatment of carriers.....	22-23, 223, 225
Tests with screening and use of top minnow.....	23
In army camps.....	24
Campaign in Southern States.....	24-25
Field staff.....	68
Field studies, 1916 to 1919.....	86-87
Experimental demonstrations in ten southern states.....	88
Extension of anti-mosquito measures to nine southern states.....	218, 220
Results and cost per capita of anti-mosquito measures.....	220, 223, 226
Anti-mosquito measures in rural districts.....	220
Use of top-feeding minnow in mosquito breeding.....	223
Distribution, administration, and dosage of quinine.....	224-225, 226-227
Re-surveys, and results of control operations.....	225
Amount expended.....	251, 252
Also.....	7, 72-73
<i>See also</i> Names of places.	
MANAGUA, NICARAGUA.....	233
MANGET, DR. F. P.....	332
MANZANILLO, MEXICO.....	235
MAO, H. C.....	286
MARACAS AREA, TRINIDAD.....	199
MARANHÃO (STATE) BRAZIL:	
Hookworm infection survey begun.....	99, 176
Rate of hookworm infection.....	127
Also.....	73
MARION COUNTY, MISSISSIPPI.....	216
MARNE, FRANCE.....	236

	PAGE
MARS, L. D.	68
MARYLAND:	
Relief and control of hookworm disease	98
MASKELIYA, UPPER, <i>see</i> UPPER MASKELIYA AREA, CEYLON.	
MASKELIYA AREA, CEYLON.	145
MASSACHUSETTS STATE DEPARTMENT OF HEALTH.	113
MATAGALPA, NICARAGUA.	233
MATALE AREA, CEYLON.	184, 185, 186, 194
MATARA, CEYLON.	213
MATTO GROSSO (STATE) BRAZIL.	133
MAURITIUS:	
Hookworm infection survey authorized	176
Gift to government of Seychelles Islands.	214
MAXWELL, DR. J. PRESTON.	279, 298
MEDICAL EDUCATION.	69
MEDICAL EDUCATION, DIVISION OF, <i>see</i> ROCKEFELLER FOUNDATION—DIVISION OF MEDICAL EDUCATION.	
MEI, CHENK-SHANG.	301
MERIDA, YUCATAN.	10, 13, 90, 229
<i>Metchnikoff</i> (LABORATORY CAR).	137, 188
METHODIST MEN'S HOSPITAL, PEKING.	321-322
METHODIST MISSION, TIENTSIN.	319
METHODIST WOMEN'S HOSPITAL, PEKING.	308, 322
METHODIST WOMEN'S HOSPITAL, TIENTSIN.	322
MEURTHE-ET-MOSELLE, FRANCE.	236
MEXICO:	
Outbreak of yellow fever.	229, 235
Also.	21, 90, 93
MEYER, ERNST C.	56, 67
MILLER, DR. F. A.	67
MILLS, DR. RALPH G.	278
MINAS GERAES (STATE) BRAZIL .	
Influence of physical features on hookworm infection.	129
Occupations and hookworm infection.	133
Hookworm infection survey and summary of results.	176, 177-178
Progress of soil sanitation.	214
Also.	73, 99, 130
MINIM (UNIT OF MEASURE)	note, 163
MINUWAGONDA, CEYLON.	213
MISSISSIPPI:	
Progress of soil sanitation.	215
Anti-mosquito measures for malaria control.	220

	PAGE
NEW MEXICO.....	137
NEW ORLEANS.....	8, 233
NEW SOUTH WALES.....	107
NEW YORK STATE BOARD OF HEALTH.....	114
NEW YORK STATE DEPARTMENT OF HEALTH.....	123
NICARAGUA:	
Re-infection surveys.....	101-102
Government appropriations for hookworm control.....	104-105
Hookworm infection index.....	135
Average hemoglobin index.....	140
Decree ordering examination of school children for hookworm disease.....	145
Chenopodium-chloroform treatment of hookworm disease....	170
Rates of re-infection.....	184-185
Government regulations regarding latrines.....	206
Latrines constructed and local inspectors maintained...	209-210
Outbreak of yellow fever and governmental efforts toward its control.....	229, 233-234
Also.....	7, 18, 19, 67, 73, 90, 98
NINETEENTH ARRONDISSEMENT, <i>see</i> PARIS, 19TH ARRONDISSE- MENT.	
NINGPO, <i>see</i> AMERICAN BAPTIST HOSPITAL, NINGPO, CHINA.	
NOGUCHI, DR. HIDEYO:	
Investigations on yellow fever at Guayaquil.....	12-14
Studies on yellow fever organism.....	90, 228
Also.....	68, 93
NORRIS, DR. W. PERRIN.....	67
NORTH, FRANK M.....	266
NORTH CAROLINA:	
Work of county health departments.....	75, 76, 79
Effects of co-operative plan of county health work.....	79-80
Method of evaluating health measures.....	85-86
State-wide latrine law.....	215
Anti-mosquito measures for malaria control.....	220
Also.....	67, 98, 220
NORTH CHINA LANGUAGE SCHOOL, PEKING.....	277
NORTH CHINA UNION MEDICAL COLLEGE FOR WOMEN, PEK- ING.....	308, 316
NORTHERN BAPTIST MISSIONS.....	332
NORTHERN PRESBYTERIAN MISSION.....	312
NORTHERN TERRITORY, AUSTRALIA.....	107
NORWEGIAN AMERICAN LUTHERAN MISSIONS.....	311
NURSES' ASSOCIATION OF CHINA.....	342

NURSES' TRAINING SCHOOLS:

For tuberculosis work in France..... 239

In connection with Peking Union Medical College..275-277, 308

NURSING SURVEY..... 123

OIL OF CHENOPodium:

Relative efficiency and cost of treatment.....159-160

Variations in strength and toxicity..... 160

Dosage.....160-161

Young's rule for administering..... 161

Experiments in distilling and testing..... 161

After effects..... 161

Widespread use in treatment of hookworm disease..... 162

Standard method of administering, with dosage for children
and adults.....162-163

Contraindications..... 163

Average efficiency of standard treatment.....163-164

Experiments among Brazilian vagabonds..... 164

Tests in efficacy under field conditions in Brazil.....164-165

Need of re-examinations after treatment..... 165

Superior efficacy of freshly prepared hard gelatin capsules.165-166

Effect of diet on efficiency..... 166-167

Omission of preliminary purge..... 167-169

Use with chloroform..... 170

Undivided doses..... 170

Use in treatment of amebic dysentery..... 171

In intra-intestinal tube method of treating hookworm disease 173

Number of worms removed by two standard treatments..... 189

Also..... 193

OKLAHOMA..... 137

OLD, H. N..... 68

OLEAN, NEW YORK:

Survey of health conditions..... 123

ONDERNEEMING INDUSTRIAL SCHOOL, BRITISH GUIANA..... 188

ORANGEBURG COUNTY, SOUTH CAROLINA..... 216

OSA, COSTA RICA..... 128

OSLER, SIR WILLIAM AND McCRAE, THOMAS:

Modern Medicine..... 342

OSWALDO CRUZ INSTITUTE, RIO DE JANEIRO..... 44

OXYGEN, *see* HOOKWORM LARVAE, VIABILITY.

PA, TA-CHIH..... 286

PACKARD, CHARLES W..... 290

	PAGE
PACKER, SOPHIE.....	285
PAI, HSIU-LAN.....	285
PAIL LATRINE, <i>see</i> LATRINES.	
PANAMA:	
Government appropriations for hookworm control.....	104-105
Average hemoglobin index.....	140
Compulsory erection of latrines.....	210
Also.....	67, 98
PAOTINGFU, <i>see</i> AMERICAN PRESBYTERIAN MISSION, MEN'S HOSPITAL, PAOTINGFU, CHINA.	
PAPUA.....	206
PARAGUAY.....	116
PARANÁ (STATE) BRAZIL:	
Prevalence of hookworm disease.....	127
Effect of altitute on hookworm infection.....	130
Hookworm infection survey and summary of results....	176-177
Progress of soil sanitation.....	214
Also.....	73, 99
PAREJA, DR. WENCESLAO.....	68, 233
PARIS, 19TH ARRONDISSEMENT:	
Work for tuberculosis control.....	29, 236
PARIS FACULTY OF MEDICINE.....	29, 236, 239
PAUL, DR. G. P.....	67
PAYNE, DR. G. C.....	68
PAYTA, PERU.....	235
PEABODY, FRANCIS W.....	57
PEARCE, DR. R. M.:	
Appointed Director of Division of Medical Education.....	44
Visit to England and Belgium.....	45
Also.....	56, 69, 116
PEKING-HANKOW RAILWAY.....	325
PEKING AMERICAN SCHOOL.....	277
PEKING UNION MEDICAL COLLEGE:	
The plant.....	39-40
Registration, students, faculty, nurses...40-41, 278-280, 283-286	
Pre-medical work.....	41-42
Translation of medical works.....	42-43
Construction, buildings, residences.....	265
Organization, with officers and members.....	265-267
Purchase of books for library.....	272-273
Work for medical school.....	273-274
Work of hospital.....	275
Nurses' training school.....	275-276, 307

	PAGE
Religious and social work.....	276-277
Peking American School.....	277
Granting of charter.....	305
History of reorganization.....	305-306
Organization of medical school.....	306-307
Construction of new buildings.....	307
Maintenance of old hospital.....	307-308
Relations with government schools at Peking.....	316-317
Also.....	7
PEKING UNION MEDICAL COLLEGE—PRE-MEDICAL SCHOOL:	
Enrollment, courses, and faculty.....	289-291, 306
PERKINS, DR. E. C.....	335
PERNAMBUCO, BRAZIL.....	234
PERU:	
Outbreak of yellow fever.....	229, 234-235
Also.....	20, 90
PESPIRE, HONDURAS.....	233
PETER'S HALL DISTRICT, BRITISH GUIANA.....	144
PHILIPPINE HOSPITAL SHIP:	
Amount expended.....	251
PI, HUA-TEH.....	286
PINGHSIANG COLLIERY, CHINA:	
Rate of hookworm infection.....	128, 215
Also.....	73-74, 196
PINGTINGCHOW, <i>see</i> CHURCH OF THE BRETHREN MISSION, SHANSI, CHINA.	
PINHEIRO, RIO DE JANEIRO (STATE).....	164
PIT PRIVIES.....	200, 203
<i>See also</i> Latrines.	
PIURA, PERU.....	234, 235
PLAIN SMEAR METHOD, <i>see</i> HOOKWORM DISEASE, DIAGNOSIS.	
PORTEUS MAZES:	
Retardation tests on children in Australia.....	147
PORTO RICO:	
Hookworm infection survey with findings....	99-100, 176, 178-179
Failure of hookworm relief measures.....	100-101
Hookworm infection in rural districts.....	130, 133
Average hemoglobin index.....	140
Also.....	25, 73, 182
POWELL, ALICE M.....	299
PRASLIN, SEYCHELLES ISLANDS.....	214
PREGNANCY.....	162, 190
<i>See also</i> Birth Rate.	

	PAGE
PRESBYTERIAN MISSION, PEKING.....	319
PRISONERS, <i>see</i> JAILS.	
PUBLIC HEALTH:	
Fellowships.....	74
Studies on administration.....	115-116
Also.....	7
<i>See also</i> County Health Officers.	
PUBLIC HEALTH COMMITTEE, NEW YORK ACADEMY OF MEDICINE.....	47
PUBLIC HEALTH EDUCATION:	
Amount expended.....	251, 252-253
PUBLIC HEALTH LABORATORY:	
Organization.....	113-114
PUBLIC HEALTH NURSES:	
Survey on training.....	47
PUBLICATION COMMITTEE, CHINA MEDICAL MISSIONARY ASSOCIATION.....	43, 302, 342
PUERTO MEXICO, MEXICO.....	229
PUNCH AND JUDY SHOWS:	
In tuberculosis work in France.....	32-34, 239
PURCELL, MARY S.....	285
PURGATIVES:	
Used with oil of chenopodium in treatment of hookworm disease.....	167-169
<i>See also</i> Hookworm Disease, Treatment; Names of drugs.	
QUEENSLAND:	
Rate of hookworm infection.....	128
Effect of rainfall on hookworm infection.....	129
Studies on mental retardation of school children.....	146-147
Government regulations regarding latrines.....	206
Progress of soil sanitation.....	214, 215
Also.....	7, 98, 107
QUETZALTEPEQUE, SALVADOR.....	233
QUININE:	
In destruction of malaria parasites.....	21, 223-225, 226, 227
<i>See also</i> Malaria Control.	
RAILWAY SANITARY CODE.....	123
RAINFALL:	
Effect on hookworm infection in Queensland.....	129
RANKIN, DR. W. S.....	85
<i>Rapid Method of Detection of Ova of Intestinal Parasites in Human Stools</i> , by Drs. C. A. Kofoed and M. A. Barber. note,	154

	PAGE
READ, DR. B. E.....	267, 273, 275, 279, 307
RED CROSS GENERAL HOSPITAL, SHANGHAI.....	309-310, 328
RED CROSS OF SIAM, <i>see</i> SIAM.	
REED, DR. WALTER.....	8-9
REFORMED CHURCH IN AMERICA (DUTCH) HOSPITAL, AMOY, CHINA.....	336
REID, JAMES C.....	266
RICE, J. L.....	67
RIO BONITO, BRAZIL:	
Rates of hookworm infection and cures.....	134
RIO DE JANEIRO (CITY):	
Government examination of school children for hookworm disease.....	145
Recurrence of yellow fever.....	234
RIO DE JANEIRO (STATE):	
Rates of hookworm infection.....	127, 135
Hookworm infection among vagabond boys.....	136, 164
Hookworm infection among children and workers on coffee plantations.....	136
Contribution of sugar manufacturers toward hookworm control.....	196
Progress of soil sanitation.....	214
Also.....	10, 80, 83, 98
RIO GRANDE DO NORTE, BRAZIL.....	234
ROBBINS, DR. EMMA E.....	299
ROBERTSON, DR. OSWALD H.....	279
ROCKEFELLER, JOHN D.....	x, xi, 48, 55, 61, 349
ROCKEFELLER, JOHN D., JR.....	x, xi, 55, 56, 57, 66
ROCKEFELLER FOUNDATION:	
Résumé of activities.....	7-8
History of control and eradication of yellow fever.....	8-11
Investigations on the inciting germ of yellow fever.....	11-14
Yellow fever campaigns in Guayaquil and Central America.....	14-20
Malaria control.....	20-25
Hookworm control measures.....	25-28
Tuberculosis work in France.....	28-34
Work of the School of Hygiene and Public Health, Johns Hopkins University.....	34-36
Modern medical conditions in China.....	36-38
Work of Peking Union Medical College.....	38-42
Appropriations for pre-medical training, hospitals, and fellowships in China.....	42-43
Aid to Canadian and other medical schools.....	43-45

	PAGE
Fellowships and scholarships.....	45-46
Relief and reconstruction in Europe.....	46-47
Sundry items of aid and service.....	47-48
Finances, with table showing receipts and expenditures.....	48-50
Report of Secretary.....	51-62
Members and principal officers.....	55-56
Regular meetings and meetings of executive committee..	56
Departmental boards, with members.....	56-57
Work with unaffiliated organizations.....	57-58
Expenditures for public health, medical education and research, war work, and miscellaneous.....	59-61
Funds and property.....	61-62
Report of Treasurer.....	345-406
Balance sheet: Exhibit A.....	352-353
Receipts and disbursements of income: Exhibit B.....	354-356
Foundation appropriations: Exhibit C.....	357-359
After care of infantile paralysis cases: Exhibit D.....	360
Mental hygiene: Exhibit E.....	360-361
Research in physics and chemistry: Exhibit F.....	362
Rockefeller Institute and medical education: Exhibit G.....	362-363
School of hygiene and public health: Exhibit H.....	364
Miscellaneous: Exhibit I.....	365-366
International Health Board: Exhibit J.....	367-373
China Medical Board: Exhibit K.....	374-388
Summary of appropriations and payments: Exhibit L.....	389-390
Appropriations and payments of special funds: Exhibit M.....	391
Statements of principal funds: Exhibit N.....	392-393
Land, buildings, and equipment funds: Exhibit O.....	394-395
Transactions relating to invested funds: Exhibit P.....	396-397
Schedule of securities in general funds: Exhibit Q.....	398-405
Schedule of securities in special funds: Exhibit R.....	406
ROCKEFELLER FOUNDATION—DIVISION OF MEDICAL EDUCATION:	
Creation and appointment of Director.....	44-45
Also.....	116
ROCKEFELLER INSTITUTE FOR MEDICAL RESEARCH:	
Study on types of latrines.....	200
RODEO, COSTA RICA:	
Increase in average hemoglobin index.....	140
Rate of hookworm re-infection.....	183
ROSE, WICKLIFFE:	
Visit to England and Belgium.....	x, xi, 45
Also.....	55, 56, 57, 66, 67

	PAGE
ROSE, WILLIAM:	
Manual of Surgery	342
ROSENAU, DR. M. J.....	217
ROSENWALD, JULIUS.....	x, xi, 55
ROSS, DR, RONALD.....	9
ROYS, DR. C. K.....	312
RUSSELL, COL. F. F.....	114
RYERSON, MARTIN A.....	x, xi, 55
ST. JOHN'S UNIVERSITY, SHANGHAI:	
Appropriations by China Medical Board....	42, 292, 309, 317-319
Also.....	287-288, 329
ST. LUCIA, WEST INDIES.....	98, 162
ST. LUKE'S HOSPITAL, SHANGHAI, <i>see</i> AMERICAN EPISCOPAL	
MISSION, SHANGHAI.	
ST. VINCENT, WEST INDIES:	
Re-infection surveys.....	101-102
SALISBURY, DONALD W.....	286
SALISBURY, NORTH CAROLINA.....	217
SALT:	
Effect on hookworm infection.....	129-130
SALVADOR:	
Hookworm re-infection surveys.....	101-102
Government appropriations for hookworm control....	104-105
Decree ordering examination of school children for hook-	
worm disease.....	145
Rate of re-infection.....	183
Government regulations regarding latrines.....	206
Progress in sanitation.....	209-210
Outbreak of yellow fever.....	229
Government efforts toward control of yellow fever....	233-234
Also.....	7, 8, 18, 19, 45, 68, 73, 90, 93, 98
SAN LORENZO, HONDURAS.....	233
SAN MIGUEL, SALVADOR.....	233
SAN SALVADOR, SALVADOR.....	183, 233
SAN VIVIEL, SALVADOR.....	233
SAND, <i>see</i> HOOKWORM LARVAE, VIABILITY.	
SANITARIALS, <i>see</i> COMMISSION FOR PREVENTION OF TUBERC-	
ULOSIS IN FRANCE.	
SANTA CATHARINA (STATE) BRAZIL:	
Hookworm infection survey.....	99, 176
Incidence of hookworm infection.....	127
Also.....	73, 80, 83

	PAGE
SANTIAGO, PANAMA.....	128
SANTO DOMINGO:	
Hookworm infection survey.....	99
SÃO JERONYMO COAL COMPANY OF RIO DO SUL, BRAZIL....	196
SÃO PAULO (STATE).	
Prevalence of hookworm and other parasitic infection....	127
Occupations and hookworm infection.....	133
Hookworm infection index.....	135
Hookworm infection among children and workers on coffee plantations.....	136
Hookworm infection and hemoglobin index among vagabond boys.....	136, 137
Tests in relative efficiency of regular and modified plans for hookworm control.....	193
Latrines on coffee plantations.....	198, 199
Progress of soil sanitation.....	214
Also.....	98, 133, 165
SÃO PAULO, UNIVERSITY OF, <i>see</i> UNIVERSITY OF SÃO PAULO— LABORATORY OF HYGIENE.	
SAWYER, DR. W. A.....	67
SAYLES, FLORENCE.....	299
SCHAPIRO, DR. LOUIS.....	67
SCHAUR, DR. MARTHA.....	285
SCHOLARSHIPS, <i>see</i> FELLOWSHIPS AND SCHOLARSHIPS,	
SCHOOL OF HYGIENE AND PUBLIC HEALTH, <i>see</i> JOHNS HOPKINS UNIVERSITY—SCHOOL OF HYGIENE AND PUBLIC HEALTH.	
SCHOOL HYGIENE, <i>see</i> UNIVERSITY OF SÃO PAULO, BRAZIL— LABORATORY OF HYGIENE.	
SCHUEFFNER, DR. WILHELM.....	127
SEDGWICK, WILLIAM T.....	56, 66
SEGOVIA, NICARAGUA.....	233
SEOUL, KOREA.....	303
SEPTIC TANK.....	200, 204-205
<i>See also</i> Latrines.	
SERGIPE, BRAZIL.....	234
SERVICE, DR. CHARLES W.....	299
SEVENTH DAY ADVENTIST MISSION, SHANGHAI.....	310
SEWAGE DISPOSAL:	
Problem defined by sanitary surveys.....	198
Special commission to study methods.....	199
Results of survey.....	200, 203
Incineration plants.....	205
Sewerage.....	205, 206

	PAGE
Soil sanitation to proceed in advance of treatment for hookworm disease.....	206
Cause of health improvement.....	215-216
Amount expended.....	251
<i>See also</i> Latrines; Names of places.	
SEYCHELLES ISLANDS:	
Diet and treatment with oil of chenopodium.....	167
Experiments on undivided doses of oil of chenopodium in treatment of hookworm disease.....	170
Rate of re-infection.....	185
Re-campaign measures for eradication of hookworm disease.....	195
Government regulations regarding latrines.....	206
Progress of soil sanitation.....	214
Reduction of hookworm infection.....	215
Also.....	7, 68, 98, 168
SHANGHAI:	
German medical school closed.....	317-318
Also.....	7, 36, 37, 328
SHANGHAI BAPTIST COLLEGE.....	318
SHANGHAI MEDICAL SCHOOL:	
Construction postponed.....	287
Organization and charter.....	308
SHANSI, <i>see</i> CHURCH OF THE BRETHREN MISSION, SHANSI, CHINA.	
SHANTUNG CHRISTIAN UNIVERSITY—MEDICAL SCHOOL.....	
.....	42, 287, 305, 310-313, 313, 316, 340
SHAOHSING, <i>see</i> AMERICAN BAPTIST HOSPITAL, SHAOHSING, CHINA.	
SHIBLEY, DR. S.....	314
SHIELDS, DR. R. T.....	312
SHIH, CH'ING-SHENG.....	286
SHUNTEHFU, <i>see</i> AMERICAN PRESBYTERIAN MISSION, MEN'S HOSPITAL, SHUNTEHFU, CHINA.	
SIA, R. H. P.....	286
SIAM:	
Extension of anti-hookworm measures.....	105-106
Appropriations by the Red Cross and International Health Board.....	106
Hookworm infection index.....	135
Hookworm infection among soldiers.....	143
Diagnosis of hookworm infection by glycerine—salt and plain smear methods.....	152-153
Treatment of dysentery with oil of chenopodium.....	171

	PAGE
Government regulations regarding latrines.....	206
Also.....	68
SIAOCHANG, <i>see</i> LONDON MISSION HOSPITAL, SIAOCHANG, CHINA.	
SLIDES, <i>see</i> HOOKWORM DISEASE, DIAGNOSIS.	
SLOAN, DR. T. DWIGHT.....	299
SLOGANS, IN PUBLIC HEALTH WORK.....	27
SMEAR METHOD, <i>see</i> HOOKWORM DISEASE, DIAGNOSIS.	
SMILLIE, DR. W. G.:	
Experiments with beta-naphthol in treatment of hookworm disease.....	172
Also.....	69, 110
SMITH COUNTY, TENNESSEE.....	216
SMYLY, DR. H. JOCELYN.....	283
SNOWDEN, A.....	99
SOCIAL HYGIENE SURVEY.....	123
SOIL SANITATION, <i>see</i> SEWAGE DISPOSAL.	
SOLDIERS:	
Hemoglobin rates.....	137
Effects of hookworm disease in Siam and treatment by Hluang Boriracksha.....	143
Re-infection rates in Costa Rica.....	184
Also.....	188
SOOCHOW, <i>see</i> SOUTHERN METHODIST HOSPITAL SOOCHOW, CHINA; SOUTHERN METHODIST MISSION, SOOCHOW, CHINA; SOUTHERN PRESBYTERIAN HOSPITAL, SOOCHOW, CHINA.	
SOUTH CAROLINA:	
Latrines.....	199, 200
Anti-mosquito measures for malaria control.....	220
Also.....	80, 98
SOUTH MAHE AREA, SEYCHELLES ISLANDS.....	195
SOUTH MANCHURIA MEDICAL COLLEGE, <i>see</i> MUDKEN MEDICAL COLLEGE, MANCHURIA.	
SOUTHERN BAPTIST HOSPITAL, CHENGCHOW, CHINA.....	326
SOUTHERN BAPTIST HOSPITAL, HWANGHIEN, CHINA.....	326
SOUTHERN BAPTIST HOSPITAL, LAICHOWFU, CHINA.....	326
SOUTHERN BAPTIST HOSPITAL, YANGCHOW, CHINA.....	330-331
SOUTHERN METHODIST HOSPITAL, SOOCHOW, CHINA.....	295, 328-329
SOUTHERN METHODIST MISSIONS.....	332
SOUTHERN METHODIST MISSION, SOOCHOW, CHINA.....	316
SOUTHERN PRESBYTERIAN HOSPITAL, KASHING, CHINA.....	331-332
SOUTHERN PRESBYTERIAN HOSPITAL, SOOCHOW, CHINA.....	295, 328

	PAGE
SOUTHERN PRESBYTERIAN MISSION.....	312
SOUTHERN STATES, <i>see</i> MALARIA CONTROL; Names of states and towns	
STEARNS, DR. THORNTON.....	311
<i>Stegomyia</i> (Mosquito):	
Breeding habits.....	9-10, 15-16
Manner of transmitting yellow fever.....	10
Also.....	10, 11, 13, 19, 21, 228, 229, 230, 233-235
STEPHENSON, BIRD R.....	291
STIFLER, WILLIAM W.....	267, 290
STILES, DR. C. W.....	161
STONE, DR. MARY.....	335
STONE, DR. PHEBE.....	335
STONE, ROBERT S.....	284
STONE COUNTY, MISSISSIPPI.....	215, 216
STOOLS, <i>see</i> HOOKWORM DISEASE, DIAGNOSIS.	
STORAGE PITS, <i>see</i> HOOKWORM LARVAE, VIABILITY.	
STRAUSS, FREDERICK.....	x, xi, 55
SŪ, YAO-WEN.....	286
SUMATRA:	
Prevalence of hookworm infection.....	127-128
Also.....	196
SUNFLOWER COUNTY, MISSISSIPPI:	
Per capita cost of malaria control.....	22-23, 226
Malaria control measures by treatment of carriers.....	224-225
Re-surveys, with results of control operations.....	225
Quinine in malaria control.....	226, 227
Also.....	73
SUTTON, BERTHA L.....	285
SWANSON, W. D.....	284, 291
SWARTZ, REV. PHILIP A.....	267, 276-277, 284
SWEET, LULA.....	285, 299
SZE, ELIZABETH.....	301
TAI, DR. MARY.....	300
TAI, ZING-LING.....	302
TAIANFU HOSPITAL, CHINA.....	322
TAIKOKU JAIL, FORMOSA.....	128
TAIYUANFU, <i>see</i> ENGLISH BAPTIST HOSPITAL, TAIYUANFU, CHINA.	
TAMIL COOLIES.....	125
TAPACHULA, MEXICO.....	229
TAYEH IRON AND STEEL WORKS, CHINA.....	73

	PAGE
TAYEH MINES, CHINA.....	128
TAYLOR, DR. ADRIAN S.....	279, 330
TAYLOR, H. A.....	68
TAYLOR, DR. R. V., JR.....	330
TEA GARDENS:	
Hookworm infection in Assam.....	126
Results of investigations in Darjeeling District.....	145
TECHOW, <i>see</i> AMERICAN BOARD HOSPITAL, TECHOW, CHINA.	
TENNESSEE:	
Anti-mosquito measures for malaria control.....	222
Also.....	98
TEXAS:	
Lack of latrines.....	199
Anti-mosquito measures for malaria control.....	222
Also.....	98, 137, 188
THYMOL:	
In treatment of hookworm disease.....	159
Relative efficiency and cost of treatment.....	159-160
Dosage.....	160
Routine dosage and conditions governing administration.....	161-162
Contraindications.....	162
Also.....	143
TIBAS COUNTY, COSTA RICA.....	209
TIENTSIN-PUKOU RAILWAY, CHINA.....	333
TIENTSIN UNION HOSPITAL.....	323
TILLAR, ARKANSAS:	
Malaria control measures.....	220
TOMLINSON, SADA.....	299
TOMPKINS, DR. C. E.....	299
TOOTELL, DR. GEORGE T.....	299
TOP MINNOW:	
In prevention of mosquito breeding.....	16, 23, 72, 223
TRAVELING EXHIBITS:	
In tuberculosis work in France.....	239
<i>Treatment of Hookworm Infection</i> , By Drs. S. T. Darling, M. A. Barber and H. P. Hacker.....	162-163
TRINIDAD:	
Hookworm re-infection surveys.....	101-102
Rates of hookworm infection and cures.....	134-135
Effects of sanitary reforms.....	144
Rates of re-infection.....	184
Latrines.....	199

	PAGE
Pre-campaign sanitation.....	209
Also.....	68, 98, 162, 199
TROUP COUNTY, GEORGIA.....	216
TSANGCHOW, <i>see</i> LONDON MISSION HOSPITAL, TSANGCHOW, CHINA.	
TSEN, DR. EDGAR T. H.....	280
TSINAN, CHINA, <i>see</i> SHANTUNG CHRISTIAN UNIVERSITY— MEDICAL SCHOOL.	
TSINGTAO, CHINA.....	317
TSO, ERNEST.....	301
TU, HAU-MIEN.....	285
TUBERCULOSIS.....	32, 35
TUBERCULOSIS WORK IN FRANCE, <i>see</i> COMMISSION FOR PRE- VENTION OF TUBERCULOSIS IN FRANCE.	
TUCKER, DR. F. F.....	299
TUNAPUNA, TRINIDAD.....	144
TUNGCHOW, CHINA.....	319
TYPHOID FEVER.....	216-217
UBATE, COLOMBIA.....	128
UNCINARIASIS COMMISSION TO THE ORIENT:	
Results of investigations on effect of hookworm infection on hemoglobin index.....	138
Results of investigations on comparative methods of exam- ination for hookworm disease.....	151-152
Diagnosis of hookworm infection by vermicides.....	157-158
Findings on relative efficacy and cost of thymol and oil of chenopodium.....	159-160, 161
Tests in administering oil of chenopodium.....	165-166
Experiments on undivided doses of oil of chenopodium in treatment of hookworm disease.....	170
Develops new type of infection survey.....	179-181
Also.....	162
UNION MEDICAL COLLEGE, FOOCHOW.....	315
UNITED FREE CHURCH MISSION.....	323
UNITED STATES ARMY:	
Hookworm infection at Camp Jackson, South Carolina...	136-137
Lowered mentality caused by hookworm disease.....	146
Methods employed in diagnosis of hookworm infection in Southern Department.....	154
UNITED STATES BUREAU OF THE CENSUS.....	115
UNITED STATES BUREAU OF EDUCATION.....	115
UNITED STATES CHILDREN'S BUREAU.....	115

	PAGE
UNITED STATES DEPARTMENT OF VITAL STATISTICS.....	35
UNITED STATES PUBLIC HEALTH SERVICE...24, 35, 87, 88, 199, 218	
UNITED STATES RAILROAD ADMINISTRATION:	
Railway sanitary code.....	123
UNIVERSITY OF SÃO PAULO, BRAZIL—LABORATORY OF HYGIENE:	
Courses offered.....	108, 110
Organization of division of school hygiene.....	110-111
Experiments on undivided doses of oil of chenopodium in treatment of hookworm disease.....	170
Experiments with worm counts.....	189
Also.....	8, 44, 69, 74, 166
UPPER MASKELIYA AREA, CEYLON.....	185-186
UTICA, NEW YORK:	
Study of laboratory needs.....	114-115
VAN DER HEIJDEN, H. N.....	127
VAUGHAN, DR. VICTOR C.....	56
VAUGHN, DR. E. I.....	67, 68
VENEZUELA.....	11
VERA CRUZ.....	10
VERMIFUGE, <i>see</i> HOOKWORM DISEASE, DIAGNOSIS.	
VICTORIA, SEYCHELLES ISLANDS.....	214
VINCENT, GEORGE E.....x, xi, 55, 56, 57, 66, 266, 303	
VIRGINIA:	
Anti-mosquito measures for malaria control.....	220
Also.....	98
VISHER, J. W.....	69
VOGT, DR. ANNA.....	299
VOGT, DR. VOLRATH.....	299
WAITE, DR. J. H.:	
Survey of health conditions at Olean, New York.....	123
Method of emulsifying stools.....	150
Also.....	114
WAMPLER, DR. FRED J.....	300
WANG, CHUN-YING.....	285
WANG, HSU-HSIEN.....	285
WANG, HSUEH-HAI.....	285
WANG, IN-CHI.....	285
WANG, SIH-TSE.....	286
WANG, STEPHEN.....	285
WASHBURN, DR. B. E.....	67
WATER, <i>see</i> HOOKWORM LARVAE, VIABILITY.	

	PAGE
WATSON, EDWARD.....	286
WELCH, DR. WILLIAM H.....	56, 57, 66, 266
WELIGAMA, CEYLON.....	213
WEST CHINA UNION UNIVERSITY.....	315
WEST INDIES:	
Progress in sanitation.....	102-103
Government regulations regarding latrines.....	206-209
Also.....	7, 21
WEST VIRGINIA:	
Campaign for relief and control of hookworm disease.	99
Also.....	73
WESTERN AUSTRALIA.....	107
WHEELER, DR. E. R.....	311
WHITE, DR. J. H.....	230
WHITESIDE, FAYE.....	285
WILLIAMS, DR. LINSLEY R.....	56, 68
WILMINGTON, NORTH CAROLINA.....	199
WILSON, GEORGE C.....	286
WILSON, STANLEY D.....	290
WILSON COUNTY, NORTH CAROLINA.....	76, 79
WINSOR, DR. S. A.:	
Variation of the brine flotation-loop method of hookworm diagnosis.....	156-157
Also.....	67, 149
WOLF, ANNA D.....	267, 275, 285, 307
WONG, CORA J.....	285
WONG, S. Y.....	284
WONG, DR. YAO.....	300
WOO, DR. ARTHUR W.....	284, 300
WOO, DR. L. S.....	301
WOO, LOO-SUNG.....	302
WOO, SHU-TAI.....	301
WOODS, DR. ANDREW H.....	279, 300
WOOSUNG, CHINA.....	318
WORM COUNTS.....	135, 179, 181, 189
<i>See also</i> Hookworm Disease, Diagnosis.	
WRIGHT, DR. J. M.....	300
WRIGHTSON, W. D.....	68
WU, HSIEN.....	301
WU, LILLIAN.....	302, 335
WUHU, <i>see</i> AMERICAN METHODIST HOSPITAL, WUHU, CHINA.	
WYATT, DR. B. L.....	68

	PAGE
YALE MISSION, <i>see</i> HUNAN-YALE MEDICAL COLLEGE.	
YANGCHOW, <i>see</i> SOUTHERN BAPTIST HOSPITAL, YANGCHOW, CHINA.	
YEAGER, DR. C. H.....	69
YELLOW FEVER:	
Early ravages.....	8
Theories of cause.....	9
Carried by <i>Stegomyia</i>	10
Chief endemic centers.....	10-11
Researches at Guayaquil.....	11-12
Investigations on germ.....	12-13
Cases in Guayaquil, 1912-1918.....	14
Campaign in Guayaquil and its results.....	14-17
Epidemic in Central America and its control.....	18-19
Control measures and their results in Guayaquil.....	88-90, 228
Outbreaks in Central America.....	90, 93
Further studies on the organism.....	90
Prevalence in Latin American countries.....	90-93
Outbreak in South and Central America and Mexico.....	229
Cases in Honduras.....	233-234
Government efforts toward control in Central America	230, 233, 234
Recurrence in Brazil.....	234
Outbreak in Peru.....	234-235
Recrudescence in Mexico.....	235
Amount expended.....	251, 252
Also.....	7, 8, 73, 108
YELLOW FEVER COMMISSION:	
Personnel.....	68
Observations at Amapala, Honduras.....	233
Also.....	228
YEN, DR. F. C.....	67
YEN, FU-CHUN.....	314
YIH, WEI-LI.....	302
YOUNG, DR. CHARLES W.....	283
YOUNG'S RULE FOR ADMINISTERING OIL OF CHENOPODIUM.....	161
YU, DR. C. M.....	284, 291
YUCATAN, MEXICO.....	235
ZAU, DR. ZUNG-DAU.....	301
ZUCKER, ADOLF E.....	280, 290

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